



ADM-Aeolus Level-2B/2C Processor

Input/Output Data Definitions Interface Control Document

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CHANGE LOG

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1.0	05 May 2006	ESA comments on first draft.
1.1 (draft)	16 Jun 2006	Correction of typographical errors in L2B Sections. Draft of L2C supplementary datasets.
1.1	21 Aug 2006	Inclusion of AUX_CLM definition. L2B updates: Moved L1B filename to auxiliary reference datasets More L1B statistics in L2B SPH & DSD re-ordering Re-define normalization of measurement weights Aux_Par_2B updates: Additional parameters
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1.40 (draft A)	30 Nov 2008	Clairifications for Missing Data Indicators. Options for ESA to consider for System field in FH. IntAus for Abs_Orbit field in MPH. Two typos in AUX_CLM description as noted by Mathieu Olivier. Typos where 'clear' and 'cloudy' were interchanged in Obs_Type fields. Remove specification of internal representation of enumerated-type processing parameters. AUX_PAR_2B updates: remove Spares, add new ZWC_Params.



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1. Introduction

1.1. Purpose of Document

This document defines the interface specification for data files that constitute the input to and output from the ADM-Aeolus Level-2B Processor (L2BP), with particular emphasis on the version to be installed in the Aeolus Ground Segment for Reprocessing purposes. The input/output files required for the L2BP and their purpose are described in [RD1]; the preliminary format definitions given therein are superseded by the current document. In general terms, the file specifications must adhere to the content and formats defined in [AD1--AD6].

For installations of the L2BP in an operational numerical weather prediction environment, e.g. a national weather service or ECMWF, an interface specification involving the BUFR format is under development [RD2]. Any such environment may also choose to install a reference version of the L2BP adhering to the input/output data definitions contained in the current document.

This document also defines those files associated with ADM-Aeolus Level-2C processing that are relevant to the Aeolus Ground Segment (specifically the Long Term Archive). Operational L2C processing is embedded within the ECMWF forecast system and is described elsewhere [RD9]. The two L2C-related files that are described here are the L2C Output Product file and the L2C Auxiliary Processing Parameters file, both in Earth-Explorer format.

L2B product parameters are a subset of L2C product parameters and hence the strategy adopted is to define a common Earth Explorer template for L2B and L2C product files. In L2B product files, the datasets that are specific to L2C processing are not defined (no DSD in the SPH). In addition, some SPH parameters that are specific to L2C processing are excluded from the definition of the L2B SPH.

1.2. Relationship of the Input/Output Data Definition Files

The relationship and normal processor flow between the seven files involved in Level-2B Processor software tasks is illustrated in Figure 1. The current document gives the Input/Output Data Definition for five of them (shaded blue) as listed in Table 1. The remaining two files (shaded yellow) are defined elsewhere, see Table 2.

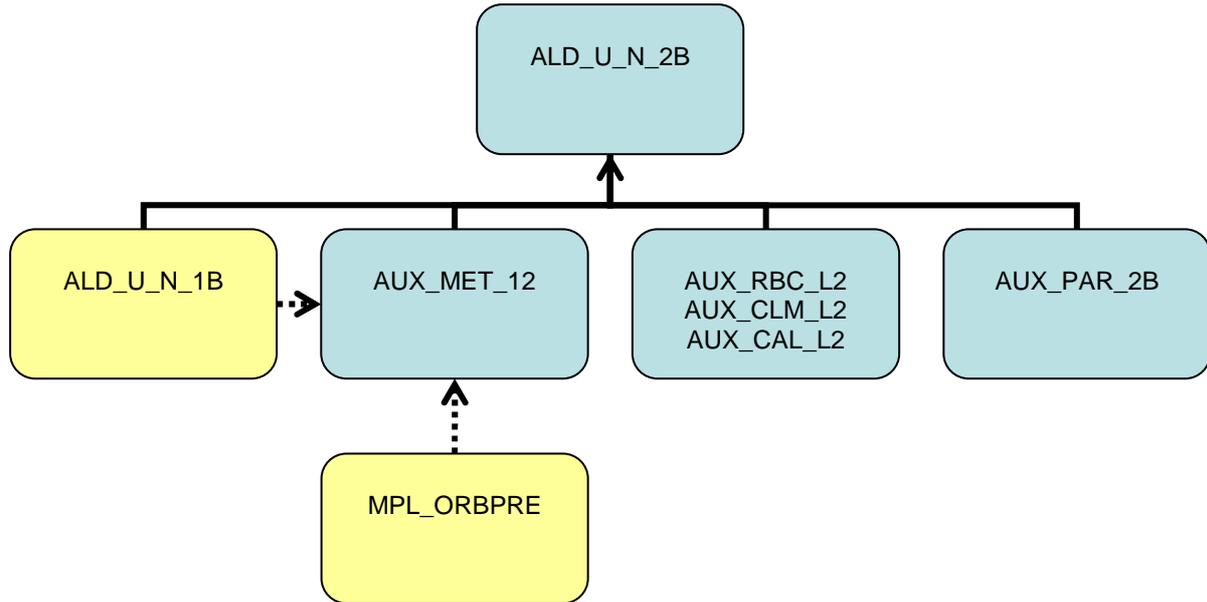


Figure 1: Relationship of Input/Output Files for the Aeolus Level-2B Processor

Table 1: List of Level-2B Input/Output Data Definition Files

File Type Identifier	File Type	Description	Created By	Used By
	Level 2B Product File			
ALD_U_N_2B	Level 2B Product File	Section 4	Level 2B Processor	
	Input Auxiliary Files			
AUX_MET_12	Auxiliary Meteorological Data (AMD)	Section 5.1	L2-PF, access via LTA	Level 2B Processor Level 2A Processor
AUX_RBC_L2	Rayleigh-Brillouin Correction (RBC) lookup table	Section 5.2	ACMF (TBC)	Level 2B Processor
AUX_CLM_L2	Climatology lookup table	Section 5.3	TBD	Level 2B and 2A Processors
AUX_CAL_L2	Calibration coefficients	Section 5.7	TBD	Level 2A and 2B Processors
AUX_PAR_2B	Level 2B Processing Parameters	Section 5.4	ACMF and/or L2-PF (ECMWF)	Level 2B Processor



Table 2: Supporting files defined in other documents

File Type Identifier	File Type	Description	Created By	Used By
	Level 1B Files			
ALD_U_N_1B (.EEE)	Level-1B Files in Earth Explorer format	[RD3, RD4]	Core PDS	Level-2B processor installed for Reprocessing
ALD_U_N_1B (.TGZ)	Level-1B Files in BUFR-TGZ format (tar,gzipped) containing 1) HDR in XML format and 2) DBL converted into Bufr format	[RD2]	L1B_EE2BUFR converter	L2-PF (ECMWF), national weather services
	Meteorological Support Files			
MPL_ORBPRES	Predicted Orbit Files	[RD6]	Core PDS (TBC)	L2-PF

- **The L2B file** is the principal output created by the ADM-Aeolus L2B Processing task. There is only one mode (Wind Component Mode) that applies in any installation of the L2BP.
- **The L1B file** is the principal instrumental input to the L2B Processor and is typically provided by the Thin Layer. Two formats are envisaged:
 - o EE-format: The content of the L1B file and its EE-format definition is contained in [RD3] but is subject to modifications defined in [RD4]. The L1B data provided to the reprocessing installation of the L2BP will be in EE-format. EE-format files may nonetheless be delivered with TGZ applied (i.e. tar, g-zipped.)
 - o BUFR-TGZ-format: The L1B data made available to the L2-PF (ECMWF) and national weather services will be a TGZ (tar, g-zipped) file containing 1) a HDR in XML and 2) a DBL that has first undergone conversion to BUFR format [RD2]. L1B files (header and geolocation information) also form one input data stream used by the L2-PF to generate auxiliary meteorological data (AUX_MET_12 files).
- **The AUX_MET_12 file** is an auxiliary input to the L2BP that is created by the L2-PF and is subsequently available from the LTA. It contains meteorological information that is not available in L1B



data, for use in Level-2B processing as well as in Level-2A processing. There are two independent input data streams for the generation of AUX_MET_12 files. The first consists of actual L1B data arriving at the L2-PF before the cut-off times of the operational schedule of the L2-PF [RD1]. The second consists of predicted orbit files (MPL_ORBPRES, discussed below).

- **The AUX_RBC_L2 file** is an auxiliary input to the L2BP that is created by the ACMF. It must be re-computed each time an Instrument Spectral Registration (ISR) is performed [RD5]. The data in the file are used as a lookup table during L2B processing to make Rayleigh-Brillouin corrections (dependent on temperature and pressure in the sensing volume).
- **The AUX_CLM_L2 file** is potentially an auxiliary input to the L2BP that is created by TBD. The data in the file are potentially used as a lookup table during L2B processing to process Rayleigh-only height bins. The file contents consist of climatological data of atmospheric optical properties.
- **The AUX_CAL_L2 file** is potentially an auxiliary input to the L2BP that is created by TBD. The data in the file are used in L2A processing, to account for Mie and Rayleigh channel cross-talk, or to retrieve atmospheric optical properties. They are potentially used for similar purposes within L2B processing. The file contents consist of instrument calibration coefficients.
- **The AUX_PAR_2B file** is an auxiliary input to the L2BP that is created by external tools (e.g. a text editor), at the discretion of the site installing the L2BP. It defines processor parameters and algorithm settings as required to define operation of the L2BP.
- As discussed above, **MPL_ORBPRES (predicted orbit) files** are an input data stream provided to the L2-PF to facilitate the generation of AUX_MET_EC files. The content of this file and its EE-format definition is contained in [RD6]. MPL_ORBPRES files will be used at the L2-PF, in combination with EE CFI software, to compute predicted orbit locations at which auxiliary meteorological data should be computed. The implementation is likely to be a standalone code that executes in the early stages of the operational assimilation suite at the L2-PF. It should be noted that the provision of AUX_MET_EC data at predicted orbit locations is contingent on the robust performance of any pre-compiled EE-CFI software used. The current working assumption is that predicted orbit files are delivered to the L2-PF at the rate of one per day, and that each file is valid for up to 7 days.
- A modified approach could be based on replacing the MPL_ORBPRES data stream with template L1B products in which the geolocation ADS is filled with predicted locations and other datasets are empty.) This need not be pursued at the current time.

2. Documents

2.1. Applicable Documents

Ref	Document title	Document ref	Ver	Date
[AD1]	PDS-IPF ICD Generic Interface Guidelines	ESA-ID-ACS-GS-0001	2.2	Aug 2006
[AD2]	ADM-Aeolus, Data Products Contents Guidelines	AE-TN-ESA-SY-007	1.B	May 2004



[AD3]	Earth Explorer Ground Segment File Format Standard	PE-TN-ESA-GS-0001	1.4	Jun 2003
[AD4]	CFI Software: Mission Conventions Document	CS-MA-DMS-GS-0001	1.3	Jul 2003
[AD5]	PDS to ECMWF: Interface Control Document.	XADM-GSEG-EOPG-ID-04-0002	1.6	Nov/Dec 2007
[AD6]	Implementation of Level 2B/2C Processing Facility. Technical Requirements	XADM-GSEG-EOPG-RD-04-0003	1.1	Jun 2004

2.2. Reference Documents

Ref	Document title	Document ref	Ver	Date
[RD1]	Selection of L2B Parameters (Study TN2.1)	AE-TN-MFG-L2P-0021	2.0	May 2006
[RD2]	WMO FM94 (BUFR) description of ADM-Aeolus L1B/L2B products	AE-TN-ECMWF-L2P-0072-TEMPLATE	1.0	Mar 2006
[RD3]	Aeolus Level 1B Processor Input/Output Data Definitions Interface Control Document	ADM-IC-52-1666	3.04 (draft)	Jan 2008
[RD4]	Aeolus Product Modifications for Implementation in L1bP Code V2	AE-TN-DLR-APM-L1B-150206	1.3	Feb 2006
[RD5]	ILIAD Lookup Table: Detailed Processing Model	AE-TN-MFG-GS-0001	1.0	Oct 2005
[RD6]	Explorer_Data_Handling Software User Manual	CS-MA-DMS-GS-0009	3.4	Nov 2005
[RD7]	ADM-Aeolus Level-2B Algorithm Theoretical Baseline Document (Mathematical Description of the Aeolus Level-2B Processor)	AE-TN-ECMWF-L2BP-0023	2.1	Feb 2007
[RD8]	ADM-Aeolus Rayleigh-Brillouin Correction Look-up Tables Generator: Input/Output Data Definitions Interface Control Document	AE-TN-MFG-GS-0003	1.2	Jun 2007
[RD9]	Definition of Baseline Aeolus Level-2C Processing (Study TN6.2)	AE-TN-ECMWF-L2BP-0062	1.0	In preparation
[RD10]	Aeolus Level 2a Processor Input/Output Data Definition	AE-IF-DLR-L2A-004	1.3	Jan 2007

2.3. Acronyms

ACMF	Aeolus Calibration and Monitoring Facility
ADS	Annotation Data Set
AMD	Auxiliary Meteorological Data
AOCS	Attitude and Orbit Control System
BRC	Basic Repeat Cycle
BUFR	Binary Universal Format for Representation
CFI	Customer Furnished Item
DBL	Data Block
DEM	Digital Elevation Map
DSD	Data Set Descriptor
DSR	Data Set Record
DS	Data Set
ECMWF	European Center for Medium-Range Weather Forecast
EE	Earth Explorer
FH	Fixed Header
HDR	Header
HLOS	Horizontal Line of Sight
KVT	Key, Value, Terminator
IAT	Instrument Auto Test
IODD	Input/Output Data Definition(s)
ICD	Interface Control Document
ISR	Instrument Spectral Registration
L1B	Level-1B
L2B	Level-2B
L2BP	Level-2B Processor
L2-PF	Level-2B Processing Facility (ECMWF)
LOS	Line Of Sight
LTA	Long Term Archive
MDS	Measurement Data Set
MPH	Main Product Header



MRC	Mie Response Calibration
NWP	Numerical Weather Prediction
PBL	Planetary Boundary Layer
PCD	Product Confidence Data
PDS	Payload Data Segment
PRF	Pulse Repetition Frequency
QC	Quality Control
RBC	Rayleigh Brillouin Correction
RRC	Rayleigh Response Calibration
SNR	Signal to Noise Ratio
SPH	Specific Product Header
VH	Variable Header
WGS84	World Global System 84 : Reference Ellipsoid for GPS data.
WMO	World Meteorological Organization
XML	Extensible Markup Language
TGZ	Tar, g-zipped.
ZWC	Zero Wind Correction

3. General Input/Output File Format

It is envisaged that all Aeolus L2B-related files handled by the Thin Layer will conform to EE-format. The general conventions for EE-format have been detailed elsewhere [AD3, RD3] but are repeated in this Section to make the current document self-contained. The L1B files destined for transfer to the L2-PF and national weather services are regarded as the sole exception: they are expected to be in BUFR-TGZ format (Section 1.2).

3.1. File Naming Conventions

The file naming conventions to be applied for Aeolus data files and products are in line with the Earth Explorer File Format Standard [AD3]. The general file name structure is:

AE_CCCC_TTTTTTTTTT_<instance_ID>.EEE

where

'AE' denotes the Aeolus mission

CCCC denotes the file class (four uppercase letters/digits)

- 'OPER' for routine operations
- 'RPRO' for routine re-processing
- 'TEST' for internal tests
- Any other string of four uppercase letters as specified by the Order_Type tag in the ThinLayer JobOrder file,

TTTTTTTTTT is the file type identifier (total of ten uppercase letters/digits/underscores).

<instance_ID> is the file instance ID (variable length, up to 41 letters/digits/underscores), where the <instance_ID> string will include creation time/validity time information

- <instance_ID> = yyyyymmddThhmmss_yyyyymmddThhmmss_vvvv
- yyyyymmddThhmmss: date/time strings of validity interval start and stop times
- vvvv: file version number (4 digits starting with 0001).

EEE is the file extension taking 3 possible values:

- 'EEF' if header and datablock are contained in a single file
- 'HDR' in the case of a header file
- 'DBL' in the case of a datablock file

For data products, the file type identifier takes the form

TTTTTTTTTT = ALD_<u/c flag>_X_<product_ID>

where

'ALD' denotes a data product from the Aladin instrument

<u/c flag> = 'U' for unconsolidated ('C' for consolidated is not applicable for Aeolus)

X = 'N' for nominal instrument operation and tests,

<product_ID> = '1B' for a Level 1B product and '2B' for a Level 2B product

Note: the valid options for X have been reviewed in response to GSDR RID 166. With the adoption of a range of File_Class values ('CCCC' above), it is not envisaged that further values for X are needed.

For auxiliary data, the file type identifier takes the form

TTTTTTTTTT = AUX_PPPPPP

where

'AUX' denotes an auxiliary file

PPPPPP = yyy_xx for calibration files

(yyy denotes the specific type of calibration and xx denotes the processor level generating the file)

= 'PAR_xx' for a processing parameter/algorithm settings file

(xx denotes the processor level that uses the file)

Three further options are introduced

= 'MET_ss' for auxiliary meteorological data

(with the file class CCCC and ss denoting the processing levels permitted to used the data, e.g. 'OPER_AUX_MET_12')

= 'RBC_ss' for Rayleigh-Brillouin correction data

(ss denotes the processor that generates the file or the processing levels permitted to used the data)

= 'CLM_ss' for climatology look-up tables

(ss denotes the processor that generates the file or the processing levels permitted to used the data)

3.2. Format Conventions (XML, KVT, Binary)

Format conventions for XML and KVT syntax are recalled in [Table 3](#) and [Table 4](#). Binary data types and corresponding sizes in bytes are also recalled in [Table 5](#). Note that these conventions are recalled from tables 3-1 and 3-2 of [\[RD3\]](#) and conform to the standards expressed in [\[AD3\]](#).

As shown in [Table 3](#), sizes in XML format are variable. Thus, throughout this document, sizes of parameters and files in XML format (i.e. HDR and EEF files) are indicative only.

Table 3: Format conventions used for headers in XML format

Format	Description	Size	Example
DateTime	Any UTC time uses the "standard with reference" format 'UTC=yyyy-mm-ddThh:mm:ss[.uuuuuu]', where: - yyyy is a 4 digits integer representing the year - mm is a 2 digits integer representing the month - dd is a 2 digits integer representing the day - hh is a 2 digits integer representing the hour - mm is a 2 digits integer representing the minutes - ss is a 2 digits integer representing the seconds - uuuuuu is a 6 digit integer representing the microseconds. For maximum consistency with the KVT format used for DBL files, the convention for Aeolus HDR files is that microseconds are not present in the FixedHeader but are present in all other DateTime fields.	23 (Fixed-Header) 30 (non-Fixed-Header)	UTC=2005-03-31T12:00:00 (FixedHeader) UTC=2005-03-31T12:00:00.123456 (all non-FixedHeader DateTimes)
String	array of characters	variable	"A_STRING"
Enum	array of characters with a fixed number of valid values	variable	"A_STRING"
Boolean	False or True	variable	False or True



IntAuc	unsigned char integer	variable	"221"
IntAc	signed char integer	variable	"-221"
IntAus	Unsigned short integer	variable	"+65535"
IntAs	signed short integer	variable	"-12828"
IntAul	unsigned long integer	variable	"1010000000"
IntAl	signed long integer	variable	"-1010000000"
IntAd	long long integer	variable	"240000000"
FAdoxy	float with x digits before the decimal point and y digits after	variable	"034.8399"
Spare	array of characters filled with blanks	variable	

Table 4: Format conventions used for headers in KVT format

Format	Description	Size (bytes)	Example
DateTime	Any UTC time uses the "Envisat with microseconds" format ' <i>dd-mmm-yyyy hh:mm:ss.uuuuuu</i> ', where: <ul style="list-style-type: none"> <i>dd</i> is a 2 digits integer representing the day <i>mmm</i> is a 3 characters string representing the month, e.g., JAN, FEB, etc. <i>yyyy</i> is a 4 digits integer representing the year <i>hh</i> is a 2 digits integer representing the hour <i>mm</i> is a 2 digits integer representing the minutes <i>ss</i> is a 2 digits integer representing the seconds <i>uuuuuu</i> is a 6 digits integer representing the micro-seconds 	27	09-OCT-2007 11:21:32.210146
String	String written with quotes before and after. The text is left justified, e.g., any added blanks should appear at the end of the field string.	variable	"A_STRING"
Enum	String without quotes	variable	A_STRING
Boolean	0 (for FALSE) or 1 (for TRUE)	1	0 or 1
IntAuc	Unsigned char integer, written with a '+' at the beginning	4	+221
IntAc	Signed char integer, written with the sign at the beginning	4	-221
IntAus	Unsigned short integer, written with a '+' at the beginning	6	+65535
IntAs	Signed integer, written with the sign at the beginning	6	-12828
IntAul	Unsigned long integer, written with a '+' at the beginning	11	+1010000000
IntAl	Signed long integer, written with the sign at the beginning	11	-1010000000
IntAd	Long long integer, written with the sign at the beginning	21	+00000000000240000000
FAdoxy	Float with x digits before the decimal point and y digits after, written with the sign at the beginning	X+Y+2	+034.8399 (FADO34)
Spare	The space is filled with blanks	40	

Table 5: Data types and corresponding size in bytes for binary data

Format	Description	Size (bytes)	Example
DateTime	Any UTC time uses the Modified Julian Date 2000 (MJD2000) format. In binary format, an MJD2000 time is represented by the format <i><days>.<seconds><microseconds></i> , where: <ul style="list-style-type: none"> <i><days></i> is a 4 byte signed long integer representing the number of days since January 1st, 2000 at 0:0 hour (which may be negative) <i><seconds></i> is a 4 byte unsigned long integer representing the number of seconds elapsed since the beginning of the day <i><microseconds></i> is a 4 byte unsigned long integer representing the number of microseconds elapsed since the last second 	12	
String	Array of characters	variable	A_STRING
Enum	A set of fixed values	1	A_STRING
Boolean	0 (for FALSE) or 1 (for TRUE)	1	0
IntAuc	Unsigned char integer	1	[0, +255]
IntAc	Signed char integer	1	[-128, +127]
IntAus	Unsigned short integer	2	[0, +65,535]
IntAs	Signed short integer	2	[-32 768, +32 767]



IntAul	Unsigned long integer	4	[0, +4 294 967 295]
IntAl	Signed long integer	4	[-2 147 483 648, +2 147 483 647]
IntAd	Long long integer	8	[-9 223 372 0368 54 775 808, +9 223 372 036 854 775 807]
FAdoxy	Double precision floating point (See Document A-22)	8	[-1.79e+308, 1.79e+308] [-2.22e-308, 2.22e-308]
Spare	Array of characters filled with space (ASCII 32) characters	variable	

3.3. General File Structure

All the Aeolus files comply with the Earth Explorer Ground Segment File Format Standard, including auxiliary and non-product files (such as processing report files).

The Aeolus L2B/L2C input and output files follow a general structure containing:

- A Fixed Header (FH) written using the XML standard. This header is identical for all files and is described in Section 3.3.1.
- A Variable Header (VH) which varies from one file type to another. It consists of
 - A Main Product Header (MPH) written using the XML standard. The MPH is identical for all files and is described in Section 3.3.2.
 - A Specific Product Header written using the XML standard. This is part of the MPH that varies for each product type, and is thus described separately for each product type in the relevant sections.
All SPH structures will include one or more Data Set Descriptors (DSDs) which describe the format/structure of individual Data Sets in the Data Block portion of the product. The DSD structure is described in Section 3.3.3.
- A Data Block (DBL) containing one or more Data Sets (DS), each consisting of one or more Data Set records (DSRs). Each product will contain different types of DSs and these are described in the relevant sections. Data sets in the Data Block can be of three different types: Measurement Data Sets (MDS), Annotation Data Sets (ADS) or Global Annotation Data Sets (GADS).

For small data volume, all components are stored in the same physical file and the data block is written using the XML standard.

For large data volume, the Data Block is stored in a separate file and has an ASCII header containing a copy of the MPH and SPH (which includes DSDs) written using KVT format.

3.3.1. Fixed Header.

The structure of the Fixed Header is common to all Earth Explorer products. It is recalled below in [Table 6](#), [Table 7](#) and [Table 8](#). An example is given in Figure 2. Note that the FH is written only once in XML in the header section of the L2B/L2C output product file. It is not repeated in the Data Block file.

Table 6: L2B/L2C Fixed Header Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Fixed_Header	Root tag.		Structure	15 0 16
File_Name	Logical file name without the extension		String	11 62 13
File_Description	One line description of the file		String	18 32 20
Notes	Multi-lines free text		String	7 32 9



Mission	String representing the mission name ('Aeolus' for the ADM-Aeolus mission). Note that, in the File_Name, the Mission ID is a two character string ('AE' for the ADM-Aeolus mission)	String	9	6	11
File_Class	OPER (file type as indicated in the file name) or TEST	String	12	4	14
File_Type	The part of the file name that gives the file type. For L2Z measurement products, the file type can be ALD_U_N_2Z, where '2Z' is '2B' or '2C'. For explanation of the different valid values see Section 3.1.	String	11	10	13
Validity_Period	See Table 7 for structure description	Structure	18	112	19
File_Version	The vvvv part of the file name (see Section 3.1)	Integer	14	4	16
Source	See Table 8 for structure description	Structure	9	172	10
Total size for XML FH in bytes:					699

Table 7: L2B Fixed Header Validity_Period Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Validity_Start	Validity start time as specified in the file name. To indicate the beginning of the mission, the special value: 'UTC=0000-00-00T00:00:00' can be used.	UTC	DateTime (without microseconds)	16 23 18
Validity_Stop	Validity stop time as specified in the file name. To indicate the end of the mission, the special value: 'UTC=9999-99-99T99:99:99' can be used.	UTC	DateTime (without microseconds)	15 23 17
Total size for XML FH in bytes:				112

Table 8: L2B/L2C Fixed Header Source Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
System	"L2_PF" for L2B/L2C product files generated by ECMWF, or "PDS" in case of re-processing at ES-RIN. Other options for consideration by ESA: L2B_PF, L2BCPF, etc.		String	8 19 10
Creator	L2BP (official name of L2B processor) or L2CP.		String	9 12 11
Creator_Version	Version of L2BP/L2CP used for the generation of the present product file.		String	17 12 19
Creation_Date	Date/time of creation.	UTC	DateTime	15 23 17
Total size for XML FH in bytes:				172

Figure 2 : Example of L2B/L2C Fixed Header.

The format applies to all the L2B-related files (including Aux Meteorological Data, Aux L2B_Param Data and Aux RBC Data)

```

<Fixed_Header>
  <File_Name>AE_TEST_ALD_U_N_2B_20071002T000001_20071002T000002_0001</File_Name>
  <File_Description>Level 2B Product</File_Description>
  <Notes>Room for some
additional remarks</Notes>
  <Mission>Aeolus</Mission>
  <File_Class>TEST</File_Class>
  <File_Type>ALD_U_N_2B</File_Type>
  <Validity_Period>
    <Validity_Start>UTC=2007-10-02T00:00:01</Validity_Start>
    <Validity_Stop>UTC=2007-10-02T00:00:02</Validity_Stop>
  </Validity_Period>
  <File_Version>0001</File_Version>
  <Source>
    <System>LOCAL</System>
    <Creator>L2BP</Creator>
    <Creator_Version>0.1</Creator_Version>
    <Creation_Date>UTC=2006-01-30T15:25:25</Creation_Date>
  </Source>
</Fixed_Header>

```



3.3.2. Main Product Header.

The structure of the MPH is common to all AEOLUS products. It is detailed in [Table 9](#). It is similar to the MPH structure of L1B products as described in section 3.3.2 of [\[RD3\]](#) and matches the standards expressed in [\[AD2\]](#) and [\[AD3\]](#). The data types (column 4) are defined in Section 3.2. Note that the MPH is written in XML in the header file and repeated in KVT in the Data Block file. This is why the size is evaluated for both KVT and XML formats in the last two columns.

Table 9: L2B/L2C Main Product Header Content Description

Tag Name	Content Description	Unit	Type	Size (KVT)	Size (XML)
Main_Product_Header	Root tag (XML format only).		Structure	N/A	22 0 23
Product	Logical file name, i.e., file name excluding the extension		String	9 62 2	9 62 11
Proc_Stage	Processing stage flag: 'S' for systematic, 'N' for nominal processing (quasi- or close to real-time), 'T' for test product, 'R' for reprocessed.		Enum	11 1 1	12 1 14
Ref_Doc	Reference document describing the product		String	9 23 2	9 23 11
Spare_1			Spare	40 0 1	10 0 11
Acquisition_Station	Acquisition station ID		String	21 20 2	21 20 23
Proc_Center	Processing centre ID, e.g., 'L2_PAF'		String	13 6 2	13 6 15
Proc_Time	Time of processing	UTC	DateTime	11 27 2	11 30 13
Software_Ver	Software version number of processing software. Format: name of processor (up to 10 characters)/version number(4 characters)		String	14 14 2	14 14 16
Spare_2			Spare	40 0 1	10 0 11
Sensing_Start	Start time of sensing	UTC	DateTime	15 27 2	15 30 17
Sensing_Stop	Stop time of sensing	UTC	DateTime	14 27 2	14 30 16
Spare_3			Spare	40 0 1	10 0 11
Phase	Phase number. If not used set to 'X'		Enum	6 1 1	7 1 9
Cycle	Cycle number		IntAuc	6 4 1	7 4 9
Rel_Orbit	Start relative orbit number		IntAs	10 6 1	11 6 13
Abs_Orbit	Start absolute orbit number		IntAus	10 6 1	11 6 13
State_Vector_Time	Time of state vector	UTC	DateTime	19 27 2	19 30 21
Delta_UT1	Delta_UT1 = UT1-UTC	s	FAdo06	10 8 4	11 8 13
X_Position	X position in Earth-fixed reference	m	FAdo73	11 12 4	12 12 14
Y_Position	Y position in Earth-fixed reference	m	FAdo73	11 12 4	12 12 14
Z_Position	Z position in Earth-fixed reference	m	FAdo73	11 12 4	12 12 14
X_Velocity	X velocity in Earth-fixed reference	m/s	FAdo46	11 12 6	12 12 14
Y_Velocity	Y velocity in Earth-fixed reference	m/s	FAdo46	11 12 6	12 12 14
Z_Velocity	Z velocity in Earth-fixed reference	m/s	FAdo46	11 12 6	12 12 14
Vector_Source	Source of orbit vectors (not used by ADM-Aeolus)		String	15 2 2	15 2 17
Spare_4			Spare	40 0 1	10 0 11
Utc_Sbt_Time	Time corresponding to SBT below (not used by ADM-Aeolus)	UTC	DateTime	14 27 2	14 30 16
Sat_Binary_Time	Satellite Binary Time (not used by ADM-Aeolus)		IntAul	16 11 1	17 11 19
Clock_Step	Clock step size (not used by ADM-Aeolus)	ps	IntAul	11 11 5	12 11 14
Spare_5			Spare	32 0 1	10 0 11
Leap_Utc	Time of occurrence of the leap second	UTC	DateTime	10 27 2	10 30 12



Leap_Sign	Leap second sign (+001 if positive leap second, -001 if negative)		IntAc	10	4	1	11	4	13	
Leap_Err	Leap second error. '1' if leap second error occurs during processing segment, '0' otherwise		Boolean	9	1	1	10	1	12	
Spare_6			Spare	40	0	1	10	0	11	
Product_Err	'1' or '0'. If '1', errors have been reported in the product. User should then refer to the SPH or Quality ADS of the product for details of the error condition. '0' otherwise.		Boolean	12	1	1	13	1	15	
Tot_Size	Total size of product (#bytes DSR+SPH+MPH)	bytes	IntAd	9	21	8	10	21	12	
Sph_Size	Length of SPH (#bytes in SPH)	bytes	IntAI	9	11	8	10	11	12	
Num_Dsd	Number of DSDs (10 for L2B files, 15 for L2C files, 4 for AMD files, 1 for RBC files, 1 for L2B_Param files, 1 for L2C_Param)		IntAI	8	11	1	9	11	11	
Dsd_Size	Length of each DSDs (#bytes for each DSD, all DSDs shall have the same length)	bytes	IntAI	9	11	8	10	11	12	
Num_Data_Sets	Number of DSs attached (not all DSDs have a DS attached)		IntAI	14	11	1	15	11	17	
Spare_7			Spare	40	0	1	10	0	11	
Total Size for KVT and XML MPH in bytes:				1247				1582		

3.3.3. Data Set Descriptor

Data Set Descriptors contain information on the structure and size of a data set in the Data Block. They have a standard structure common to all Aeolus products, are defined in [AD3, RD3] and recalled here in [Table 10](#). They are included in the SPH.

Table 10: Data Set Descriptor Content Description

Tag Name	Content Description	Unit	Type	Size(KVT)	Size(XML)
Dsd	Root tag (XML format only).		Structure	N/A	6 0 7
DS_Name	DS descriptor ASCII string describing the data set		String	9 28 2	9 28 11
DS_Type	Type of DS. 'M' if Measurement DS, 'A' if Annotation DS, 'G' if Global ADS and 'R' if Reference DS (no DS attached)		Enum	8 1 1	9 1 11
Filename	If DS_Type='R', this field contains the name of external file used to process the current product. Otherwise, this field is left blank		String	10 62 2	10 62 12
Ds_Offset	Offset in bytes from the beginning of the file	bytes	IntAd	10 21 8	11 21 13
Ds_Size	Size of Data Set	bytes	IntAI	8 11 8	9 11 11
Num_Dsr	Number of Data Set Records in Data Set		IntAI	8 11 1	9 11 11
Dsr_Size	Size of Data Set Record, -1 if DSRs have variable sizes.	bytes	IntAI	9 11 8	10 11 12
Byte_Order	"3210". For binary DS's to designate byte order is most significant byte first.		String	12 4 2	12 4 14
Spare_1			Spare	32 0 1	10 0 11
Total size for KVT and XML in bytes				288	357

3.4. L2B/L2C/AMD Conventions for Missing Data Indicators

Where it is practical to do so, L2B/L2C and AMD products will adopt conventions for Missing Data Indicators. Such conventions are not a requirement of the Earth Explorer format but are regularly found in meteorological applications. The conventions are that, for integer datatypes, the maximum value is reserved to denote missing data; and for real datatypes (i.e. FAdoxy), the value 1.7×10^{38} is reserved to denote missing data. In practice, different computing platforms will have different representations for 1.7×10^{38} and this is taken into account by applying a tolerance when checking for a Missing Data Indicator: any real value greater than or equal to $0.99 \times 1.7 \times 10^{38}$ is regarded as a Missing Data Indicator. The use of Missing Data Indicators is additional to the standard practice of report-



ing PCD parameters to indicate whether product parameters are suitable for use.



4. Level 2B/2C Product

This section details the organization and structure of L2B/L2C output products, which are generated using the Level-1B Wind Measurement Product as input to the Level-2B/2C processor.

L2B and L2C product files are defined by a common template. They differ in the values of some header parameters, and in the number of dataset records in some of the datasets.

The Level-2B/2C Product contains vertical profiles of HLOS wind component at the observation scale, derived from meteorologically-weighted averages of L1B measurement data, as well as error estimates and reliability data for each dataset. These profiles are fully geo-located, indicating latitude, longitude and altitude. Note however that a major intended application for the L2B product is its use by the numerical weather prediction community and hence altitude is referenced to a geoid; altitude above the WGS84 ellipsoid can be inferred because the geoid height above the WGS84 reference ellipsoid is also provided in the L2B/L2C Product. Further details are contained in [\[RD1\]](#).

L2C products contain supplementary information derived from processing of Aeolus L1B/L2B data within a data assimilation system. Such information consists of vertical profiles of horizontal wind vectors (2 components) at the observation scale, associated error estimates, and further information related to the quality of L2B data within the assimilation system. The supplementary information is contained in 3 datasets that are only present for L2C products.

Provision has been made to store more than one L2B/L2C profile for each BRC, to reflect different selection and weighting of L1B measurements according to the meteorological conditions within each BRC. Nonetheless, the basic structure of L2B/L2C Measurement Data Sets is the same as for L1B output products, that is, there is systematically one DSR for each BRC (or L1B observation) and, within each L2B/L2C MDS, the DSR has a fixed size. The possibility to have more than one L2B/L2C profile for a given BRC (see discussion in [\[RD1\]](#)) is made possible by reserving in all L2B/L2C MDS enough space to store a maximum number M_{Mie} , $M_{Rayleigh} \geq 1$ of profiles. The numbers M_{Mie} and $M_{Rayleigh}$ can be different, but are both constant throughout one L2B/L2C file. They may vary from one file to the next depending on the atmospheric scenes probed by the lidar. The working assumption is that these values will not exceed 5 in most cases. Data fields for unused profiles are stored with TBD.

4.1. Product Structure

The Level-2B/2C product conforms to the product structure defined in Section 3.3.

4.1.1. File Name

The Level-2B/2C Product file name has the format defined in Section 3.1:

AE_CCCC_ALD_U_X_2Z_yyyymmddThhmmss_yyyymmddThhmmss_vvvv.EEE



where 'ZZ' can be '2B' or '2C'. The extension `EEE` is `HDR` for the header and `DBL` for the data block.

That is, the Level-2B/2C product consists of two files:

- A header containing a Fixed Header, MPH, and SPH with DSDs. The header is in XML format and has extension `EEE='HDR'`.
- A datablock containing a copy of MPH and SPH in KVT format followed by the DataSets in binary format. The data block has the file extension `EEE='DBL'`.

4.1.2. File Structure

The Header File contains a Fixed Header and a Variable Header. The Variable Header contains the MPH as described in Section 3.3 and the L2B/L2C SPH. The L2B/L2C SPH is described in Section 4.2 below. The Data Sets in the datablock are described in Section 4.3.

4.2. Specific Product Header

The Specific Product Header of L2B/L2C Data Products is detailed in [Table 11](#). Note that some parameters are only present in L2C data products.

Table 11: L2B/L2C Specific Product Header Content Description

Name	Description / Comment	Unit	Type	Size (KVT)	Size (XML)
Specific_Product_Header	Root tag (XML format only).		Structure	N/A	26 0 27
Sph_Descriptor	Specific Product Header descriptor: ASCII string describing the product		String	16 28 2	16 28 18
Spare_1			Spare	40 0 1	10 0 11
Num_BRC	Number of BRCs in the product. This is also the number of Data Set Records in the Measurement Data Sets as there is systematically one DSR for each BRC.		IntAus	8 6 1	9 5 11
Intersect_Start_Lat	Latitude of the intersection of WGS84 DEM and the satellite line-of-sight for the first measurement (first measurement centroid time of the first BRC)	10-6degN	IntAI	20 11 11	21 9 23
Intersect_Start_Long	Longitude of the intersection of WGS84 DEM and the satellite line-of-sight for the first measurement (first measurement centroid time of the first BRC)	10-6degE	IntAI	21 11 11	22 10 24
Intersect_Stop_Lat	Latitude of the intersection of WGS84 DEM and the satellite line-of-sight for the last measurement (last measurement centroid time of the last BRC)	10-6degN	IntAI	19 11 11	20 9 22
Intersect_Stop_Long	Longitude of the intersection of WGS84 DEM and the satellite line-of-sight for the last measurement (last measurement centroid time of the last BRC)	10-6degE	IntAI	20 11 11	21 10 23
Sat_Track	Sub-satellite track heading at the sensing start time in the MPH	deg	FAdo36	10 11 6	11 11 13
Spare_2			Spare	40 0 1	10 0 11
M_Mie	Maximum number of Mie profiles reserved for all the DSR in the file. See section 4.		IntAuc	6 4 1	7 4 9
M_Rayleigh	Maximum number of Rayleigh profiles reserved for all the DSR in the file. See section		IntAuc	11 4 1	12 4 14



	4.				
M_Meas	Maximum number of measurements reserved for all measurement-level information in each DSR in the file. This value is used to dimension the lists L1B_Mie_Meas_Screening and L1B_Rayleigh_Meas_Screening in Table 17 , L2B_AMD_Collocations in Table 31 , L2B_Mie_Meas_Classification in Table 35 , L2B_Rayleigh_Meas_Classification in Table 39 , and the L1_Measurement structures in Table 51 and Table 56 .		IntAuc	7 4 1	8 4 10
Num_Valid_Mie_Profiles	Number of valid Mie profiles. Beware, this number can be less than, or greater than the number of BRCs. This second option may happen when a discrimination is done in a BRC between e.g. cloudy and clear scenes and two independent profiles are produced.		IntAus	23 6 1	24 5 26
Num_Valid_Rayleigh_Profiles	Number of valid Rayleigh profiles. Beware, this number can be less than, or greater than the number of BRCs. This second option may happen when a discrimination is done in a BRC between e.g. cloudy and clear scenes and two independent profiles are produced.		IntAus	28 6 1	29 5 31
Num_Clear_Mie_Profiles	Number of clear (no cloud) Mie profiles		IntAus	23 6 1	24 5 26
Num_Clear_Rayleigh_Profiles	Number of clear (no cloud) Rayleigh profiles		IntAus	28 6 1	29 5 31
Num_Cloud_Mie_Profiles	Number of cloudy Mie profiles		IntAus	23 6 1	24 5 26
Num_Cloud_Rayleigh_Profiles	Number of cloudy Rayleigh profiles		IntAus	28 6 1	29 5 31
Num_Mie_Prof_Warm_Pulses	Number of Mie profiles using warm-up pulses		IntAus	25 6 1	26 5 28
Num_Rayleigh_Prof_Warm_Pulses	Number of Rayleigh profiles using warm-up pulses		IntAus	30 6 1	31 5 33
Num_Profiles_Surface_Mie	Number of Mie profiles reported in L2B extending down to the surface		IntAus	25 6 1	26 5 28
Num_Profiles_Surface_Ray	Number of Rayleigh profiles reported in L2B extending down to the surface		IntAus	25 6 1	26 5 28
Num_Valid_Obs_Prof_L1B_Mie	Number of Mie profiles flagged valid at observation level in L1B input file		IntAus	27 6 1	28 5 30
Num_Valid_Obs_Prof_L1B_Ray	Number of Rayleigh profiles flagged valid at observation level in L1B input file		IntAus	27 6 1	28 5 30
Num_Valid_Meas_Prof_L1B_Mie	Number of Mie profiles flagged valid at measurement level in L1B input file		IntAus	28 6 1	29 5 31
Num_Valid_Meas_Prof_L1B_Ray	Number of Rayleigh profiles flagged valid at measurement level in L1B input file		IntAus	28 6 1	29 5 31
Num_Valid_Obs_Bins_L1B_Mie	Number of Mie range-bins flagged valid at observation level in L1B input file		IntAus	27 6 1	28 5 30
Num_Valid_Obs_Bins_L1B_Ray	Number of Rayleigh range-bins flagged valid at observation level in L1B input file		IntAus	27 6 1	28 5 30
Num_Valid_Meas_Bins_L1B_Mie	Number of Mie range-bins flagged valid at measurement level in L1B input file		IntAus	28 6 1	29 5 31
Num_Valid_Meas_Bins_L1B_Ray	Number of Rayleigh range-bins flagged valid at measurement level in L1B input file		IntAus	28 6 1	29 5 31
Num_Invalid_Meas_Prof_L1B_Mie	Number of Mie profiles flagged invalid at measurement level in L1B input file		IntAus	30 6 1	31 5 33
Num_Invalid_Meas_Prof_L1B_Ray	Number of Rayleigh profiles flagged invalid at measurement level in L1B input file		IntAus	30 6 1	31 5 33
Num_Invalid_Meas_Prof_L2B_Mie	Number of Mie profiles valid in L1B input file but flagged invalid at measurement level during L2B processing		IntAus	30 6 1	31 5 33
Num_Invalid_Meas_Prof_L2B_Ray	Number of Rayleigh profiles valid in L1B input file but flagged invalid at measurement level during L2B processing		IntAus	30 6 1	31 5 33
Num_Invalid_Meas_Bins_L1B_Mie	Number of Mie range-bins flagged invalid at measurement level in L1B input file		IntAus	30 6 1	31 5 33
Num_Invalid_Meas_Bins_L1B_Ray	Number of Rayleigh range-bins flagged invalid at measurement level in L1B input file		IntAus	30 6 1	31 5 33
Num_Invalid_Meas_Bins_L2B_Mie	Number of Mie range-bins valid in L1B input file but flagged invalid at measurement level during L2B processing		IntAus	30 6 1	31 5 33
Num_Invalid_Meas_Bins_L2B_Ray	Number of Rayleigh range-bins valid in L1B input file but flagged invalid at measurement		IntAus	30 6 1	31 5 33



	level during L2B processing				
Spare_3			Spare	40 0 1	10 0 11
Num_Valid_Obs_L2B_Mie	Number of Mie observations valid in L2B file (any observation class, any range bin)		IntAus	22 6 1	23 5 25
Num_Valid_Obs_L2B_Ray	Number of Rayleigh observations valid in L2B file (any observation class, any range bin)		IntAus	22 6 1	23 5 25
Num_Invalid_Obs_L2C_Mie	Number of Mie observations valid in L2B file but flagged invalid during L2C processing (any observation class, any range bin; only present in L2C products.)		IntAus	24 6 1	25 5 27
Num_Invalid_Obs_L2C_Ray	Number of Rayleigh observations valid in L2B file but flagged invalid during L2C processing (any observation class, any range bin; only present in L2C products.)		IntAus	24 6 1	25 5 27
Spare_4			Spare	40 0 1	10 0 11
List_of_Dsds	See Table 12 for a description			2880 (L2B) 4320 (L2C)	3570 (L2B) 5355 (L2C)
Total size for KVT and XML in bytes				4297 (L2B) 5799 (L2C)	5891 (L2B) 7790 (L2C)

4.2.1. Data Set Descriptors

The Data Sets listed in Table 12 appear in Aeolus Level-2B/2C products, each described by a DSD in the SPH.

Table 12: Level-2B/2C Data Sets

DSD Number	Name	Description / Comment	DataSet Type	Update Frequency
1	Geolocation_ADS	DSD for Geolocation & AOCs data. See Table 13 for a description.	A	1 DSR per BRC
2	Product_Confidence_Data_ADS	DSD for Product Confidence Data. See Table 16 for a description.	A	1 DSR per BRC
3	Mie_HLOSwind_MDS	DSD for Mie HLOS winds. See Table 51 for a description.	M	1 DSR per BRC
4	Rayleigh_HLOSwind_MDS	DSD for Rayleigh HLOS winds. See Table 56 for a description.	M	1 DSR per BRC
- (L2B) 5 (L2C)	Assim_PCD_ADS	DSD for L2C-related Assimilation Product Confidence Data (one DSR / BRC in L2C products, only present in L2C products). See Table 59 for a description.	A	1 DSR per BRC in L2C products, no DSR in L2B products
- (L2B) 6 (L2C)	Mie_VecWind_MDS	DSD for Mie vector winds (one DSR / BRC in L2C products, only present in L2C products). See Table 72 for a description.	M	1 DSR per BRC in L2C products, no DSR in L2B products
- (L2B) 7 (L2C)	Rayleigh_VecWind_MDS	DSD for Rayleigh vector winds (one DSR / BRC in L2C products, only present in L2C products). See Table 75 for a description.	M	1 DSR per BRC in L2C products, no DSR in L2B products
5 (L2B) 8 (L2C)	Aeolus_Level_1B_Product	DSD for input Aeolus Level 1B Product	R	No DS
6 (L2B) 9 (L2C)	Aux_Met_Product	DSD for input Auxiliary Meteorological Data (for re-processing).	R	No DS
7 (L2B) 10 (L2C)	Aeolus_RBC	DSD for Rayleigh-Brillouin look-up tables (auxiliary input file)	R	No DS
8 (L2B) 11 (L2C)	Clim_Product	DSD for climatology look-up tables (auxiliary input file)	R	No DS
9 (L2B) 12 (L2C)	Cal_Product	DSD for calibration coefficients (auxiliary input file)	R	No DS
10 (L2B) 13 (L2C)	Level_2B_Proc_Params	DSD for L2B processor settings (auxiliary file).	R	No DS
- (L2B) 14 (L2C)	Aeolus_Level_2B_Product	DSD for input L2B file (only present in L2C products)	R	No DS

		ADM-Aeolus Level-2B/2C Processor Input/Output Data Definitions (IODD) ICD		Ref: AE-IF-ECMWF-L2BP-001 Version: 1.40 (Draft A) Date: 30 Nov 2008	
- (L2B) 15 (L2C)	Level_2C_Proc_Params	DSD for L2C processor settings (auxiliary file, only present in L2C products).	R	No DS	

A description of the “Data Set Type” can be found in Table 10. Note that seven datasets are of type ‘A’ or ‘M’, meaning ‘Annotation’ or ‘Measurement’, which implies that they are included in the L2B/L2C datablock file. Their content is described in Section 4.3. The remaining eight data sets are stored in auxiliary files and are of type ‘R’, i.e. they are simply referenced by Data Set Descriptors (DSD) in the SPH.

4.3. Data Sets

The number of height bins in L2B/L2C wind profiles is always 24 (nominal number of height bins). When no wind is produced at a given height bin or when the measured wind is invalid, the corresponding data field is filled with a missing data indicator (currently 1. E37 for *reals*, $2^{31}-1=2147483647$ for *integers*) and a quality flag is set in the corresponding DSR of the MDS.

4.3.1. Geolocation & AOCS ADS

The Geolocation and AOCS ADS gives the position and AOCS parameters of Mie and Rayleigh HLOS and vector winds. Its DSR is described in [Table 13](#). Altitude of Mie or Rayleigh winds are referenced to a geoid according to the discussion in [\[RD1, Section 3.2.1\]](#). DEM intersections are referenced to the WGS84 ellipsoid as in L1B Geolocation and AOCS ADS.

For the date and time, only one information is given: the date and time of the first laser pulse of the profile. No end or centre-of-gravity time is given because the time elapsed between the first and last pulse of a profile is so short that it will bring no useful information to the L2B or L2C processing. Thus, *Start_of_Obs_Time* in Table 13 is only a time-stamp for the reported observation and precise correspondence with reported geolocation data is not intended. For the use of L2B/L2C products in meteorological applications, it is considered sufficiently precise to report geolocation start and end positions (latitudes and longitudes) as the values of the closest corresponding measurement centroid time, such values being available in L1B products.

Table 13: L2B/L2C Geolocation and AOCS ADSR Content Description

Name	Description / Comment	Unit	Type	Size (binary)
<i>Start_of_Obs_Time</i>	Start date and time of Observation (or BRC). This is a timestamp for the observation. A precise correspondence with reported geolocation data is not intended.	UTC	DateTime	12
<i>N_Obs_Mie_Actual</i>	Number of meaningful Mie profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed <i>M_Mie</i> .		IntAs	2
<i>N_Obs_Rayleigh_Actual</i>	Number of meaningful Rayleigh profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed <i>M_Rayleigh</i> .		IntAs	2
<i>Mie_Geolocation</i>	List of profile geolocations. This list contains the geolocations of the <i>M_Mie</i> possible wind profiles pertaining to the observation. See Table 14 for structure description.		list of <i>M_Mie</i> structures	7260
<i>Rayleigh_Geolocation</i>	List of profile geolocations. This list contains the geolocation of the <i>M_Rayleigh</i> possible wind profiles pertaining to the observation. See Table 14 for structure description.		list of <i>M_Rayleigh</i> structures	7260



WGS84_to_Geoid_Altitude	Height of geoid above WGS84 ellipsoid.	m	IntAI	4
Total size in bytes				14540

Table 14: L2B/L2C Geolocation List_of_Mie_Geolocations and List_of_Rayleigh_Geolocations Content Description

Name	Description / Comment	Unit	Type	Size (binary)
List_of_Profile_Height_Bin_Geolocation	List geolocation parameters of the 24 height bins of the profile (Table 15)		list of 24 structures	1440
Latitude_of_DEM_Intersection	Latitude of the intersection of the DEM and the line-of-sight	10-6degN	IntAI	4
Longitude_of_DEM_Intersection	Longitude of the intersection of the DEM and the line-of-sight	10-6degE	IntAI	4
Altitude_of_DEM_Intersection	Altitude relative to the geoid of the intersection of the DEM and the line-of-sight	m	IntAI	4
Total size in bytes				1452

Table 15: L2B/L2C Geolocation List_of_Profile_Height_Bin_Geolocation Content Description

Name	Description / Comment	Unit	Type	Size (binary)
Latitude_Start	Latitude of the start point of the profile height bin (as at the closest L1B Measurement Centroid Time).	10-6degN	IntAI	4
Latitude_Stop	Latitude of end point of the profile height bin (as at the closest L1B Measurement Centroid Time)	10-6degN	IntAI	4
Latitude_COG	Latitude of the center-of-gravity point of the profile height bin. The algorithm is given in [RD7].	10-6degN	IntAI	4
Longitude_Start	Longitude of the start point of the profile height bin (as at the closest L1B Measurement Centroid Time).	10-6degE	IntAI	4
Longitude_Stop	Longitude of the end point of the profile height bin (as at the closest L1B Measurement Centroid Time).	10-6degE	IntAI	4
Longitude_COG	Longitude of the center-of-gravity point of the profile height bin. The algorithm is given in [RD7].	10-6degE	IntAI	4
Altitude_Bottom	Bottom altitude of the height bin. The altitude is reference to a geoid. It is rounded to the nearest integer	m	IntAI	4
Altitude_Top	Top altitude of the height bin. The altitude is reference to a geoid. It is rounded to the nearest integer	m	IntAI	4
Altitude_COG	Altitude of the center-of-gravity of the height bin. The altitude is reference to a geoid. It is rounded to the nearest integer	m	IntAI	4
LOS_Azimuth	Azimuth of the target-to-satellite pointing vector.	deg	FAdo32	8
LOS_Elevation	Elevation of the target-to-satellite pointing vector	deg	FAdo22	8
LOS_Satellite_Velocity	Line-of-sight velocity of the satellite	m/s	FAdo32	8
Total size in bytes				60

4.3.2. Product Confidence Data (PCD) ADS

The L2BP will report the L2B QC parameters described below in the generated L2B output file. For the convenience of the general scientific user, the dataset is copied identically in the corresponding L2C output file.

Table 16: L2B/L2C Product Confidence Data ADSR Content Description

Name	Description / Comment	Unit	Type	Binary
N_Meas	Number of L1 measurements reported by the L1B product for this BRC. Note this figure may vary from one BRC to the other.		IntAs	2
N_Obs_Mie_Actual	Number of meaningful Mie profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed M_Mie.		IntAs	2
N_Obs_Rayleigh_Actual	Number of meaningful Rayleigh profiles in this BRC. Note this figure may vary from one BRC to		IntAs	2



	the other but will not exceed M_Rayleigh.			
L1B_Input_Screening	Structure describing any problems found during reading of the L1B datafile (see Table 17)		structure	6884
L2B_AMD_Screening	Structure describing any problems found during reading of the L2B_AMD datafile (see Table 31)		structure	223
L2B_Mie_Classification_QC	Structure describing QC parameters resulting from the Mie Classification algorithm (see Table 35)		structure	19105
L2B_Rayleigh_Classification_QC	Structure describing QC parameters resulting from the Rayleigh Classification algorithm (see Table 39)		structure	19105
L2B_Mie_processing_QC	Structure describing QC parameters resulting from the Mie processing algorithm (see Table 43)		structure	9866
L2B_Rayleigh_Processing_QC	Structure describing QC parameters resulting from the Rayleigh processing algorithm (see Table 46)		structure	4586
Spare				20
Total size in bytes				59795

Table 17: L2B/L2C Product Confidence Data L1B_Input_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_Obs_Screening	A code describing a problem which prevent using this whole BRC (see Table 18 for a list of valid values).		IntAuc	1
L1B_Obs_Screening_Flags1 L1B_Obs_Screening_Flags2 L1B_Obs_Screening_Flags3 L1B_Obs_Screening_Flags4 L1B_Obs_Screening_Flags5	5 bytes each holding up to 8 flags, so in total 40 flags to store individual problems detected in the L1B_Obs screening. Bit 1 in byte 1 : TBD Bit 2 in byte 1 : TBD ... Bit 3 in byte 4 : TBD ... Bit 8 in byte 5 : TBD		5*IntAuc	5
L1B_Mie_Meas_Screening	List of M_Meas structures describing the problems found for each Mie measurement (see Table 19). Only the first N_Meas are meaningful in any BRC.		list of M_Meas structures	3417
L1B_Rayleigh_Meas_Screening	List of M_Meas structures describing the problems found for each Rayleigh measurement (see Table 23) Only the first N_Meas are meaningful in any BRC.		list of M_Meas structures	3417
L1B_MRC_Screening	Structure describing any problems found during reading the L1B MRC datafile (see Table 27)		Structure	6
L1B_RRC_Screening	Structure describing any problems found during reading the L1B RRC datafile (see Table 28)		Structure	6
L1B_ZWC_Screening	Structure describing any problems found during reading the L1B ZWC datafile (see Table 29)		Structure	6
L1B_RBC_Screening	Structure describing any problems found during reading the L1B RBC datafile (see Table 30)		Structure	6
Spare_1				20
Total size in bytes				6884

Table 18: Valid values for the L1B_Obs_Screening field of the L2B/L2C Product Confidence Data L1B_Input_Screening structure

(The structure is part of Table 17. Values larger than 0 indicate why the whole Obs/BRC is not used. A total of 255 different conditions can be flagged in this way, but only the first one that occurs is reported. Only 18 conditions are defined here but more can be added later without changing the datastructures.)

Numerical value	name	Condition
File reading related:		
0	L1B_File_OK	L1B file contents seems OK



1	L1B_HDR_Corrupted	L1B file does not match the format definition (a problem was present in one of the headers)
2	L1B_BRC_Corrupted	L1B file does not match the format definition (a problem was present in the binary data for this BRC/Obs)
...		
Laser related:		
10	L1B_Laser_Freq_Unlocked	nmeas with laser_freq_unlocked above a threshold (=1?)
11	L1B_Ref_Pulses_Unlocked	nrefpulses with laser_freq_unlocked above a threshold (=1?)
12	L1B_Laser_Freq_Offset	average laser freq. offset above a threshold (=... MHz?)
13	L1B_Laser_UV_Energy	average laser UV energy below a threshold (=... mJ?)
14	L1B_Laser_Freq_Offs_Stdev	Standard deviation for laser frequency offset above a threshold(=...MHz?)
15	L1B_Laser_UV_Energy_Stdev	Standard deviation for laser pulse UV energy above a threshold (=... mJ?)
16	L1B_Mie_Mean_Emit_Freq	Mie mean emitted frequency out of valid range
17	L1B_Mie_Emit_Freq_Stdev	Mie emitted frequency standard deviation is out of valid range
18	L1B_Rayl_Mean_Emit_Freq	Rayleigh mean emitted frequency out of valid range
19	L1B_Rayl_Emit_Freq_Stdev	Rayleigh emitted frequency standard deviation is out of valid range
...		
Satellite related:		
20	L1B_Sat_Not_on_Target	nmeas with sat_not_on_target above a threshold (=1?)
...		
Measurement related:		
30	L1B_Mie_corrupt	nmeas with corrupt Mie meas. above a threshold (=1?)
31	L1B_Rayleigh_corrupt	nmeas with corrupt Rayleigh meas. above a threshold (=1?)
32	L1B_Mie_Ref_Pulses_Corrupt	nmeas with corrupt Mie ref. pulses above a threshold (=1?)
33	L1B_Rayl_Ref_Pulses_Corrupt	nmeas with corrupt Rayleigh ref. pulses above a threshold (=1?)
...		
Combinations:		
40	L1B_Mie_Invalid_Meas	Num_of_mie_invalid_measurements above a threshold (=1?)
41	L1B_Mie_Invalid_Ref_Pulses	Num_of_mie_invalid_reference_pulse above a threshold (=1?)
42	L1B_Rayl_Invalid_Meas	Num_of_rayleigh_invalid_measurements above a threshold (=1?)
43	L1B_Rayl_Invalid_Ref_Pulses	Num_of_rayleigh_invalid_reference_pulse above a threshold (=1?)
44	L1B_Invalid_Num_Mie_Peaks	TBD
...		

Table 19: L2B/L2C Product Confidence Data L1B_Mie_Meas_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_Mie_Meas_QC	A code describing a problem which prevent using this Mie measurement (see Table 20 for a list of valid values).		IntAuc	1
L1B_Mie_Meas_QC_Flags	Flags describing problems which prevent using this Mie Measurement. Bit 1 : TBD Bit 2 : TBD ... Bit 8 : TBD		IntAuc	1
L1B_Mie_Meas_Bin_Screening	List of 24 structures describing the problems found for each Mie measurement Bin (see Table 21)		list of 24 structures	48
Spare_1				1
Total size in bytes				51

Table 20: Valid values for the L1B_Mie_Meas_QC field of the L2B/L2C Product Confidence Data L1B_Mie_Meas_Screening structure

Numerical value	Name	condition
0	L1B_Mie_Meas_OK	L1B Mie measurement contents seems OK
1	L1B_Mie_Meas_Invalid_Ref_Pulses	num_of_mie_invalid_reference_pulses above a threshold (=1?)
2	L1B_Avg_Laser_Freq_Offset	Avg_Laser_Frequency_Offset outside allowed range
3	L1B_Avg_UV_Energy	Avg_UV_Energy outside allowed range
4	L1B_Laser_Freq_Offset_Stdev	Laser_Frequency_Offset_Std_Dev outside allowed range
5	L1B_UV_Energy_Std_Dev	UV_Energy_Std_Dev outside allowed range for this measurement
6	L1B_Vel_of_Att_Uncertainty_Error	Velocity_of_Attitude_Uncertainty_Error outside allowed range
7	L1B_Mie_Mean_Emitted_Freq	Mie_Mean_Emitted_Frequency outside allowed range
8	L1B_Mie_Emitted_Freq_Stdev	Mie_Emitted_Frequency_Std_Dev outside allowed range
9	L1B_Meas_Reference_Pulse_FWHM	Mie Measurement Reference_Pulse_FWHM outside allowed range
...		



Table 21: L2B/L2C Product Confidence Data L1B_Mie_Meas_Bin_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_Mie_Meas_Bin_QC	A code describing a problem which prevent using this Mie measurement bin (see Table 22 for a list of valid values)		IntAuc	1
L1B_Mie_Meas_Bin_QC_Flags	Flags describing problems which prevent using this Mie measurement bin. Bit 1 : TBD Bit 2 : TBD ... Bit 8 : TBD		IntAuc	1
Total size in bytes				2

Table 22: Valid values for the L1B_Mie_Meas_Bin_QC field of the L1B_Mie_Meas_Bin_Screening structure

Numerical value	Name	condition
0	L1B_Mie_Bin_OK	L1B Mie height Bin contents seems OK
1	L1B_Mie_Bin_Invalid	this Mie measurement Bin has been flagged invalid by the L1BP
2	L1B_Scattering_Ratio	Scattering_Ratio_Mie not within valid range
3	L1B_Mie_SNR	Mie_Signal_to_Noise_Ratio is below the processing threshold
50	L1B_Bin_Contains_Surface	the ground surface was detected inside this range bin
51	L1B_Bin_Contains_Surface_DEM	the ground surface is inside this range bin according to the DEM and the remaining bin thickness is too small to be used
52	L1B_Bin_Below_Surface	this range bin is below the surface (surface was detected in the signal of a range bin above this one)
53	L1B_Bin_Below_Surface_DEM	this range bin is below the surface according to the DEM
...		

Table 23: L2B/L2C Product Confidence Data L1B_Rayleigh_Meas_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_Rayleigh_Meas_QC	A code describing a problem which prevent using this Rayleigh measurement (see Table 24 for a list of valid values)		IntAuc	1
L1B_Rayleigh_Meas_QC_Flags	Flags describing problems which prevent using this Rayleigh measurement. Bit 1 : TBD Bit 2 : TBD ... Bit 8 : TBD		IntAuc	1
L1B_Rayleigh_Meas_Bin_Screening	List of 24 structures describing the problems found for each Rayleigh measurement Bin (see Table 25)		list of 24 structures	48
Spare_1				1
Total size in bytes				51

Table 24: Valid values for the L1B_Rayleigh_Meas_QC field of the L1B_Rayleigh_Meas_Screening structure

Numerical value	Name	condition
0	L1B_Rayleigh_Meas_OK	L1B Rayleigh measurement contents seems OK
1	L1B_Rayleigh_Meas_Invalid_Ref_Pulses	num_of_Rayleigh_invalid_reference_pulses above a threshold (=1?)
2	L1B_Avg_Laser_Freq_Offset	Avg_Laser_Frequency_Offset outside allowed range
3	L1B_Avg_UV_Energy	Avg_UV_Energy outside allowed range
4	L1B_Laser_Freq_Offset_Stdev	Laser_Frequency_Offset_Std_Dev outside allowed range
5	L1B_UV_Energy_Stdev	UV_Energy_Std_Dev outside allowed range for this measurement
6	L1B_Vel_of_Att_Uncertainty_Error	Velocity_of_Attitude_Uncertainty_Error outside allowed range
7	L1B_Rayleigh_Mean_Emitted_Freq	Rayleigh_Mean_Emitted_Frequency outside allowed range



8	L1B_Rayleigh_Emitted_Freq_Stdev	Rayleigh_Emitted_Frequency_Std_Dev outside allowed range
...		

Table 25: L2B/L2C Product Confidence Data L1B_Rayleigh_Meas_Bin_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_Rayleigh_Bin_QC	A code describing a problem which prevent using this Rayleigh measurement bin (see Table 26 for a list of valid values)		IntAuc	1
L1B_Rayleigh_Meas_Bin_QC_Flags	Flags describing problems which prevent using this Mie measurement bin. Bit 1 : TBD Bit 2 : TBD ... Bit 8 : TBD		IntAuc	1
Total size in bytes				2

Table 26: Valid values for the L1B_Rayleigh_Bin_QC field of the L1B_Rayleigh_Meas_Bin_Screening structure

Numerical value	Name	condition
0	L1B_Rayleigh_Bin_OK	L1B Rayleigh height Bin contents seems OK
1	L1B_Rayleigh_Meas_Bin_Invalid	this Rayleigh measurement Bin has been flagged invalid by the L1BP
2	L1B_Rayleigh_SNR_A	Rayleigh_Signal_to_Noise_Ratio_Channel_A outside valid range
3	L1B_Rayleigh_SNR_B	Rayleigh_Signal_to_Noise_Ratio_Channel_B outside valid range
50	L1B_Bin_Contains_Surface	the ground surface was detected inside this range bin
51	L1B_Bin_Contains_Surface_DEM	the ground surface is inside this range bin according to the DEM and the remaining bin thickness is too small to be used
52	L1B_Bin_Below_Surface	this range bin is below the surface (surface was detected in the signal of a range bin above this one)
53	L1B_Bin_Below_Surface_DEM	this range bin is below the surface according to the DEM
...		

Table 27: L2B/L2C Product Confidence Data L1B_MRC_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_MRC_Valid	A flag indicating this calibration is valid		IntAuc	1
Spare_1				5
Total size in bytes				6

Table 28: L2B/L2C Product Confidence Data L1B_RRC_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_RRC_Valid	A flag indicating this calibration is valid		IntAuc	1
Spare_1				5
Total size in bytes				6

Table 29: L2B/L2C Product Confidence Data L1B_ZWC_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_ZWC_Valid	A flag indicating this calibration is valid		IntAuc	1
Spare_1				5
Total size in bytes				6

Table 30: L2B/L2C Product Confidence Data L1B_RBC_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L1B_RBC_Valid	A flag indicating the Rayleigh Brillouin look-up tables were found correct		IntAuc	1
Spare_1				5



Total size in bytes	6
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Table 31: L2B/L2C Product Confidence Data L2B_AMD_Screening_Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_AMD_Screening_QC	A code describing a problem which prevent using this L2B_AMD file (see Table 32 for a list of valid values)		IntAuc	1
L2B_AMD_Screening_QC_Flags	Flags describing problems which prevent using this L2B_AMD file. Bit 1 : TBD Bit 2 : TBD ... Bit 8 : TBD		IntAuc	1
L2B_AMD_Collocations	List of M_Meas structures describing the problems found while collocating each measurement (see Table 33). Only the first N_Meas are meaningful in any BRC.		list of M_Meas structures	201
Spare_1				20
Total size in bytes				223

Table 32: Valid values for the L2B_AMD_Screening_QC field of the L2B_AMD_Screening structure

Numerical value	Name	condition
0	L2B_AMD_OK	L2B_AMD contents seems OK
1	L2B_AMD_Corrupt_Header	L2B_AMD datafile does not match format definition (header problem)
2	L2B_AMD_Corrupt_Profile	L2B_AMD datafile does not match format definition (problem in the file format definition of one of the profiles)
3	L2B_AMD_Unlikely_Profile	L2B_AMD datafile has strange, unphysical values, in one of its profiles
...		

Table 33: L2B/L2C Product Confidence Data L2B_AMD_Collocations_Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_AMD_Collocation_QC	A code describing what problem occurred during the collocation of this measurement with the AUX NWP data (see Table 34 for a list of valid values)		IntAuc	1
L2B_AMD_Collocation_QC_Flags	Flags describing what problems occurred during the collocation of this measurement with the AUX NWP data. Bit 1 : TBD Bit 2 : TBD ... Bit 8 : TBD		IntAuc	1
Spare_1				1
Total size in bytes				3

Table 34: Valid values for the L2B_AMD_Collocation_QC field of the L2B_AMD_Collocation structure

Numerical value	Name	condition
0	L2B_AMD_Coll_OK	L2B_AMD profile was successfully collocated to this measurement
1	L2B_AMD_Coll_Failed	no AMD profile close to this measurement location was present in the AMD datafile
...		

Table 35: L2B/L2C Product Confidence Data L2B_Mie_Classification_QC Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Mie_Meas_Classification	List of M_Meas structures describing the results of the Mie classification algorithm for each measurement (see Table 36). Only the first N_Meas are meaningful in any BRC.		list of M_Meas structures	17755

		ADM-Aeolus Level-2B/2C Processor Input/Output Data Definitions (IODD) ICD		Ref: AE-IF-ECMWF-L2BP-001 Version: 1.40 (Draft A) Date: 30 Nov 2008	
L2B_Mie_Obs_Classification	List of M_Mie structures describing the results of the scene classification for each reported Mie observation (see Table 37)			list of M_Mie structures	1330
Spare_1					20
Total size in bytes					19105

Table 36: L2B/L2C Product Confidence Data L2B_Mie_Meas_Classification_QC Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Mie_Meas_Bin_Classification	List of 24 structures describing the results of the Mie classification algorithm for each measurement bin (see Table 38)		list of 24 structures	264
Spare_1				1
Total size in bytes				265

Table 37: L2B/L2C Product Confidence Data L2B_Mie_Obs_Classification_QC Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Mie_Obs_Class_Flags	Flags describing classification properties for the current Mie observation. Bit 1 (L2B_Mie_Obs_Class_Cloud_Above) : a cloud layer was detected in a range bin higher than the current observation range bin Bit 2 (L2B_Mie_Obs_Class_Cloud) : this observation contains clouds Bit 3 (L2B_Mie_Obs_Class_Aerosol) : this observation contains a Mie backscatter layer, but not a cloud Bit 4 (L2B_Mie_Obs_Class_Precipitation) : Precipitation is present in this observation ... Bit 8 : TBD		IntAuc	1
L2B_Mie_Obs_Bin_Classification	List of 24 structures describing the results of the classification algorithm for each reported observation bin (see Table 38)		list of 24 structures	264
Spare_1				1
Total size in bytes				266

Table 38: L2B/L2C Product Confidence Data L2B_Mie_Meas_Bin_Classification_QC and L2B Product Confidence Data L2B_Mie_Obs_Bin_Classification Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Mie_Meas_Class_Flags1 L2B_Mie_Meas_Class_Flags2	Flags describing classification properties for the current Mie measurement rangebin. Bit 1 (L2B_Mie_Class_Cloud_Above) : a cloud was detected in a range bin higher than the current range bin Bit 2 (L2B_Mie_Class_Cloud) : this rangebin contains a cloud Bit 3 (L2B_Mie_Class_Maybe_Cloud) : this rangebin contains possibly a cloud, but the backscatter is close to the threshold Bit 4 (L2B_Mie_Class_Aerosol) : Mie backscatter is present, but it is not a cloud Bit 5 (L2B_Mie_Class_Precipitation) : Precipitation is present in this range bin Bit 6 (L2B_Mie_Class_No_Extinction) : No extinction is known for this range bin Bit 7 (L2B_Mie_Class_Unknown_Scatterer) : the value encountered in this rangebin for backscatter is unphysical for clouds Bit 8 (L2B_Mie_Class_Broken_Clouds) : this range bin contains a broken cloud layer (currently only used for Obs range bins) Bit 9 (L2B_Mie_Class_Convective_Clouds) : this range bin contains convective clouds Bit 10 (L2B_NWP_Data_Used) : Flag indicating that NWP data was used to determine the classification of this range-		2*IntAuc	2



	bin ... Bit 16 : TBD			
L2B_Reliability	A measure for the reliability of the classification result for this rangebin		FAdoxy	8
Spare_1				1
Total size in bytes				11

Table 39: L2B/L2C Product Confidence Data Rayleigh_Classification_QC Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Rayleigh_Meas_Classification	List of M_Meas structures describing the results of the Rayleigh observation algorithm for each measurement (see Table 40). Only the first N_Meas are meaningful in any BRC.		list of M_Meas structures	17755
L2B_Rayleigh_Obs_Classification	List of M_Rayleigh structures describing the results of the scene classification for each reported Rayleigh observation (see Table 41)		list of M_Rayleigh structures	1330
Spare_1				20
Total size in bytes				19105

Table 40: L2B/L2C Product Confidence Data L2B_Rayleigh_Meas_Classification Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Rayleigh_Meas_Bin_Classification	List of 24 flag values describing the results of the Rayleigh classification algorithm for each measurement bin (see Table 42)		list of 24 structures	264
Spare_1				1
Total size in bytes				265

Table 41: L2B/L2C Product Confidence Data L2B_Rayleigh_Obs_Classification Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Rayleigh_Obs_Class_Flags	Flags describing classification properties for the current Rayleigh observation. Bit 1 (L2B_Rayl_Obs_Class_Cloud_Above) : a cloudlayer was detected in a range bin higher than the current observation range bin Bit 2 (L2B_Rayl_Obs_Class_Cloud) : this observation contains clouds Bit 3 (L2B_Rayl_Obs_Class_Aerosol) : this observation contains a Mie backscatter layer, but not a cloud Bit 4 (L2B_Rayl_Obs_Class_Precipitation) : Precipitation is present in this observation ... Bit 8 : TBD		IntAuc	1
L2B_Rayleigh_Obs_Bin_Classification	List of 24 flag values describing the results of the classification algorithm for each reported observation bin (see Table 42)		list of 24 structures	264
Spare_1				1
Total size in bytes				266

Table 42: L2B/L2C Product Confidence Data L2B_Rayleigh_Meas_Bin_Classification and L2B Product Confidence Data L2B_Rayleigh_Obs_Bin_Classification Content Descriptor

Name	Description / Comment	Unit	Type	Binary
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L2B_Rayleigh_Meas_Class_Flags	Flags describing classification properties for the current Rayleigh measurement rangebin. Bit 1 (L2B_Rayl_Class_Cloud_Above) : a cloud was detected in a range bin higher than the current range bin Bit 2 (L2B_Rayl_Class_Cloud) : this rangebin contains a cloud Bit 3 (L2B_Rayl_Class_Maybe_Cloud) : this rangebin contains possibly a cloud, but the backscatter is close to the threshold Bit 4 (L2B_Rayl_Class_Aerosol) : Mie backscatter is present, but it is not a cloud Bit 5 (L2B_Rayl_Class_Precipitation) : Precipitation is present in this range bin Bit 6 (L2B_Rayl_Class_No_Exinction) : No extinction is known for this range bin Bit 7 (L2B_Rayl_Class_Unknown_Scatterer) : the value encountered in this rangebin for backscatter is unphysical for clouds Bit 8 (L2B_Rayl_Class_Broken_Clouds) : this range bin contains a broken cloud layer (currently only used for Obs range bins) Bit 9 (L2B_Rayl_Class_Convective_Clouds) : this range bin contains convective clouds Bit 10 (L2B_NWP_Data_Used) : Flag indicating that NWP data was used to determine the classification of this rangebin ... Bit 16 : TBD		2*IntAuc	2
L2B_Reliability	A measure for the reliability of the classification result for this rangebin		FAdoxy	8
Spare_1				1
Total size in bytes				11

Table 43: L2B/L2C Product Confidence Data L2B_Mie_Processing_QC Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Obs_Mie_QC	List of M_Mie structures describing the results of the Mie processing for each reported observation (see Table 44)		list of M_Mie structures	9845
Mie_Background_High	A value of 1 indicates that this data was taken during daylight, so possibly the background radiation level is high.		IntAuc	1
Spare_1				20
Total size in bytes				9866

Table 44: L2B/L2C Product Confidence Data L2B_Obs_Mie_QC Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Obs_Mie_Bin_QC	List of 24 structures describing the results of the Mie processing for each reported range bin (see Table 45)		list of 24 structures	1968
Spare_1				1
Total size in bytes				1969

Table 45: L2B/L2C Product Confidence Data L2B_Obs_Mie_Bin_QC Content Description

Name	Description / Comment	Unit	Type	Binary
Hlos_Error_Estimate	Error estimate reported by the Mie processing algorithm, as defined in [RD7]	m/s	FAdoxy	8
Reliability_Number	Probably to be derived from the SNR, to catch cases in which signal level is too low (for which fitting the spectrum might be very difficult)		FAdoxy	8



L2B_Obs_Mie_Bin_Flags	Flags describing Mie processing results for the current rangebin. Bit 1 (Hlos_Gross_Error): the reported hlos is probably wrong (decided by setting a threshold on the above Reliability_Number) Bit 2 (Hlos_Deviates_From_Rayleigh) : the reported Mie hlos result deviates too much from the reported Rayleigh hlos result according to the L2B processor (only available when rangebins match 1-to-1, and when height assignments are identical) Bit 3 (NWP_Data_Used_Opt_Prop) : NWP data was used to derive the optical properties (extinction and/or backscatter ratio) used for determining the height assignment ... Bit 8 : TBD		IntAuc	1
Fitting_Amplitude	Amplitude of the curve used for fitting the Mie spectrum		FAdoxy	8
Fitting_Residual	Residual after the fit to the Mie spectrum is performed (should also give an idea of the reliability of the fit)		FAdoxy	8
Fitting_Offset	Offset of the curve used for fitting the Mie spectrum		FAdoxy	8
Fitting_FWHM	FWHM of the curve used for fitting the spectrum. This gives a measure of the wind variability in this rangebin (should the amplitude and/or offset of the curve also be reported here?)		FAdoxy	8
Mie_SNR	SNR of the Mie spectrum		FAdoxy	8
Extinction	Extinction used to determine the height assignment for this rangebin	1/m	FAdoxy	8
Scattering_Ratio	Scattering_Ratio used to estimate the extinction for this rangebin		FAdoxy	8
Variability_Measure	Measure of the variability between the measurements of this observation for this rangebin (algorithm TBD)		FAdoxy	8
Spare_1				1
Total size in bytes				82

Table 46: L2B/L2C Product Confidence Data L2B_Rayleigh_Processing_QC Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Obs_Rayleigh_QC	List of M_Rayleigh structures describing the results of the Rayleigh processing for each reported observation(see Table 47)		list of M_Rayleigh structures	4565
Rayleigh_Background_High	A value of 1 flags that this data was taken during daylight, so possibly the background radiation level is high.		IntAuc	1
Spare_1				20
Total size in bytes				4586

Table 47: L2B/L2C Product Confidence Data L2B_Obs_Rayleigh_QC Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Obs_Rayleigh_Bin_QC	List of 24 structures describing the results of the Rayleigh processing for each reported range bin (see Table 48)		list of 24 structures	912
Spare_1				1
Total size in bytes				913

Table 48: L2B/L2C Product Confidence Data L2B_Obs_Rayleigh_Bin_QC Content Description

Name	Description / Comment	Unit	Type	Binary
Hlos_Error_Estimate	Error estimate reported by the Rayleigh processing algorithm, as defined in [RD7]	m/s	FAdoxy	8
L2B_Obs_Rayleigh_Bin_Flags	Flags describing Rayleigh processing results for the current rangebin. Bit 1 (Hlos_Deviates_From_Mie) : the reported Mie hlos result deviates too much from the reported Rayleigh hlos result according to the L2B processor (only available when rangebins match 1-to-1, and when the height assignments are identical) Bit 2 (dv_dT_Above_Threshold) : derivative dv/dT above a given threshold, so result may be very sensitive to background NWP field Bit 3 (dv_dp_Above_Threshold) : derivative dv/dp above a given threshold, so result may be very sensitive to background NWP field Bit 4 (dv_drho_Above_Threshold) : derivative dv/drho above a given		3*IntAuc	3



	threshold, so result may be very sensitive to background NWP field Bit 5 (dv_dR_Above_Threshold) : derivative dv/dR above a given threshold, so result will be very sensitive to the Rayleigh response R Bit 6 (NWP_Data_Used_Opt_Prop) : NWP data was used to derive the optical properties (extinction and/or backscatter ratio) used for determining the height assignment Bit 7 (Mie_Decontamination_Performed) : indicate whether Mie decontamination of the Rayleigh range bin was performed (only possible when Mie and Rayleigh rangebins match 1-to-1) Bit 8 (Mie_Usefull_Signal_Available) : Indicate whether the actual Mie usefull signal was used for Mie decontamination. If not then the value was estimated using the backscatter ratio Bit 9 (rho_variability_above_Threshold) : the variability in the backscatter ratio is above a given threshold Bit 10 (R_variability_Threshold) : the variability in the Rayleigh response is above a given threshold ... Bit 24 : TBD			
Extinction	Extinction used to determine the height assignment for this rangebin	1/m	FAdoxy	8
Scattering_Ratio	Scattering_Ratio used to estimate the Mie signal used in Mie decontamination for this rangebin		FAdoxy	8
Variability_Measure	Some measure of the variability between the measurements of this observation for this rangebin (how to determine?)		FAdoxy	8
extinction_method	Method was used to determine the extinction for this rangebin (see Table 49 for a list of valid values)		IntAuc	1
scattering_ratio_method	Method used to determine the scattering ratio rho (see Table 50 for a list of valid values)		IntAuc	1
Spare_1				1
Total size in bytes				38

Table 49: Valid values for the extinction_method field of the L2B/L2C Product Confidence Data L2B_ObsRayleigh_Bin_QC structure

Numerical value	Name	method
0	Extinction_Meth_Undefined	Undefined.
1	Extinction_Not_Available	Not available.
2	Extinction_From_NWP_Comp	Using NWP information as specified in the ATBD [RD7]
...		

Table 50: Valid values for the scattering_ratio_method field of the L2B/L2C Product Confidence Data L2B_ObsRayleigh_Bin_QC structure

Numerical value	Name	Method
0	Scat_Ratio_Meth_Undefined	Undefined.
1	Scat_Ratio_From_L1B	Computed from L1B Mie channel (arithmetic average)
2	Scat_Ratio_From_2_Channels	Computed from L1B Mie and Rayleigh channel information combined
3	Scat_Ratio_Ass_Mie_ext_Ratio	tbd
...		

4.3.3. Mie HLOSwind Profiles MDS

The content of the DSR for the Mie HLOS wind Measurement Data Set (MDS) is detailed in Table 51.

Table 51: L2B/L2C Mie HLOSwind Data Set MDSR Content Description

Name	Description / Comment	Unit	Type	Binary
Start_of_Obs_Time	Start date and time of the observation or BRC covered by the present DSR. This is the same time as in the Geolocation ADS repeated here for cross-checking purposes.	UTC	DateTime	12
N_Meas	Number of L1 measurements reported by the L1B product for this BRC. Note this figure may vary from one BRC		IntAs	2



	to the other.			
N_Obs_Mie_Actual	Number of meaningful Mie profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed M_Mie.		IntAs	2
P	Total number of laser pulses (valid or invalid) fired during one measurement.		IntAs	2
Map_of_L1_Measurements_Used	Structure (M_Meas columns of 24 height bins, but only N_Meas are used in any BRC/DSR) giving the attribution of each L1 measurement to the L2B profile (see Table 52). The measurement index varies fastest, the range-bin index varies slowest.		Structure	1608
List_of_L1_Measurement_Weights	Structure (M_Meas columns of 24 height bins, but only N_Meas are used in any BRC) giving the relative weights of each of the N_Meas L1 measurements acquired in the same height bin to the wind indicated in Map_of_L1_Measurements_Used. The weights are positive integer numbers between 0 and 1000. For each height bin, the maximum weight in each observation class must be equal to 1000 (see Table 53). The measurement index varies fastest, the range-bin index varies slowest.		Structure	3216
List_of_Mie_Profiles	Structure containing all the information related to the M_Mie wind profiles associated to the current observation (i.e. wind velocities, validity flags...). See Table 54 .		list of M_Mie structures	1265
Total size in bytes				6107

**Table 52: L2B/L2C Mie HLOSwind Data and L2B/L2C Rayleigh HLOSwind Data
Map_of_L1_Measurements_Used Content Description**

Name	Description / Comment	Unit	Type	Binary
L1_Measurement_Used	Positive integer number for the current L1 measurement between 0 and M_channel (M_Mie or M_Rayleigh for the Mie and Rayleigh datasets respectively) pointing to the L2B profile. Zero indicates the L1 measurement was not used ; a number between 1 and M_channel points to an L2B profile.		IntAuc	1
Total size in bytes				1

**Table 53: L2B/L2C Mie HLOSwind Data and L2B/L2C Rayleigh HLOSwind Data
List_of_L1_Measurements_Weights Content Description**

Name	Description / Comment	Unit	Type	Binary
L1_Measurement_Weights	Relative weight (integer number between 0 and 1000) of the current L1 measurement making up the observation indicated by L1_Measurement_Used.		IntAus	2
Total size in bytes				2

Table 54: L2B/L2C Mie HLOSwind Data List_of_Mie_Profiles Content Description

Name	Description / Comment	Unit	Type	Binary
Obs_Type	Defines whether this observation was classified as cloud, no cloud. 0 : no observation (remember there can be less than M_Mie meaningful profiles in a BRC) 1 : cloudy 2 : clear ...		IntAuc	1
Spare_1	Reserved for a 36-character Obs_Type_String			36
List_of_Mie_Height_Bin_Winds	Structure containing 24 sub-structures with all the information pertaining to the 24 possible height bins of the profile (see Table 55).		list of 24 structures	216
Total size in bytes				253



Table 55: L2B/L2C Mie HLOSwind Data List_of_Mie_Height_Bin_Winds Content Description

Name	Description / Comment	Unit	Type	Binary
Validity_Flag	Validity flag (1 or TRUE = valid, 0 or FALSE = invalid) attached to the reported wind height bin velocity.		Boolean	1
Mie_Wind_Velocity	Wind velocity given in cm/s and rounded to the nearest integer.	cm/s	IntAs	2
Mie_Error_Quantifer	Error quantifier in cm/s associated to the Mie height bin wind velocity.	cm/s	IntAus	2
Integration_Length	Integration length for the reported Mie height bin wind.	m	IntAul	4
Total size in bytes				9

4.3.4. Rayleigh HLOSwind Profiles MDS

The detail of the DSR for the L2B/L2C Rayleigh HLOS wind profiles is given in Table 56.

Table 56: L2B/L2C Rayleigh HLOSwind Data Set MDSR Content Description

Name	Description / Comment	Unit	Type	Binary
Start_of_Obs_Time	Start date and time of the observation or BRC covered by the present DSR. This is the same time as in the Geolocation ADS repeated here for cross-checking purposes.	UTC	DateTime	12
N_Meas	Number of L1 measurements reported by the L1B product for this BRC. Note this figure may vary from one BRC to the other.		IntAs	2
N_Obs_Rayleigh_Actual	Number of meaningful Rayleigh profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed M_Rayleigh.		IntAs	2
P	Total number of laser pulses (valid or invalid) fired during one measurement.		IntAs	2
Map_of_L1_Measurements_Used	Structure (M_Meas columns of 24 height bins, but only N_Meas are used in any BRC) giving the attribution of each L1 measurement to the L2B profile (see Table 52). The measurement index varies fastest, the range-bin index varies slowest.		Structure	1608
List_of_L1_Measurement_Weights	Structure (M_Meas columns of 24 height bins, but only N_Meas are used in any BRC) giving the relative weights of each of the N_Meas L1 measurements acquired in the same height bin to the wind indicated in Map_of_L1_Measurements_Used. The weights are positive integer numbers between 0 and 1000. For each height bin, the maximum weight in each observation class must be equal to 1000 (see Table 53). The measurement index varies fastest, the range-bin index varies slowest.		Structure	3216
List_of_Rayleigh_Profiles	Structure containing all the information related to M_Rayleigh wind profiles (i.e. wind velocities, validity flags...). See Table 57 .		list of M_Rayleigh structures	3185
Total size in bytes				8027

Table 57: L2B/L2C Rayleigh HLOSwind Data List_of_Rayleigh_Profiles Content Description

Name	Description / Comment	Unit	Type	Binary
Obs_Type	Defines whether this observation was classified as cloud, no cloud. 0 : no observation (remember there can be less than M_Rayleigh meaningful profiles in a BRC) 1 : cloudy 2 : clear ...		IntAuc	1
Spare_1	Reserved for a 36-character Obs_Type_String			36
List_of_Rayleigh_Height_Bin_Winds	Structure containing 24 sub-structures with all the information pertaining to the 24 possible height bins of the profile (see Table 58).		List of 24 structures	600



Total size in bytes

637

Table 58: L2B/L2C Rayleigh HLOSwind Data List_of_Rayleigh_Height_Bin_Winds Content Description

Name	Description / Comment	Unit	Type	Binary
Validity_Flag	Validity flag (1 or TRUE = valid, 0 or FALSE = unvalid) attached to the reported wind height bin velocity.		Boolean	1
Rayleigh_Wind_Velocity	Wind velocity given in cm/s and rounded to the nearest integer.	cm/s	IntAs	2
Rayleigh_Wind_to_Pressure	First-order derivative of the HLOS wind with respect to the pressure inside the sensing volume. This parameter shall be used to correct the reported HLOS wind from pressure modifications brought by the assimilation.	10-6m/s/Pa	IntAs	2
Rayleigh_Wind_to_Temperature	First-order derivative of the HLOS wind with respect to the temperature inside the sensing volume. This parameter shall be used to correct the reported HLOS wind from temperature modifications brought by the assimilation.	cm/s/K	IntAs	2
Rayleigh_Wind_to_Backscatter_Ratio	First-order derivative of the HLOS wind with respect to the backscattering ratio inside the sensing volume. This parameter shall be used to correct the reported HLOS wind if the reference backscatter ratio is modified.	cm/s	IntAs	2
Reference_Pressure	Reference pressure used for inverting the Rayleigh response into an HLOS wind. This pressure information is taken from the numerical weather prediction model.	Pa	IntAul	4
Reference_Temperature	Reference temperature used for inverting the Rayleigh response into an HLOS wind. This temperature information is taken from the numerical weather prediction model.	10-2K	IntAus	2
Reference_Backscatter_Ratio	Reference backscatter ratio used for inverting the Rayleigh response measured by the lidar. This parameter is provided by the L1B algorithm.	10-6	IntAul	4
Rayleigh_Error_Quantifer	Error quantifier in cm/s associated to the Rayleigh height bin wind velocity.	cm/s	IntAus	2
Integration_Length	Integration length for the reported Rayleigh height bin wind.	m	IntAul	4
Total size in bytes				25

4.3.5. Assimilation Product Confidence Data (PCD) ADS

This dataset is only present in L2C products.

The content of the DSR for the L2C Assimilation Product Confidence Annotation Data Set (MDS) is detailed in Table 59.

Table 59: L2C Assimilation Product Confidence Data ADSR Content Description

Name	Description / Comment	Unit	Type	Binary
N_Meas	Number of L1 measurements reported by the L1B product for this BRC. Note this figure may vary from one BRC to the other.		IntAs	2
N_Obs_Mie_Actual	Number of meaningful Mie profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed M_Mie.		IntAs	2
N_Obs_Rayleigh_Actual	Number of meaningful Rayleigh profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed M_Rayleigh.		IntAs	2
L2B_Input_Screening	Structure describing any problems found during reading of the L2B data (see Table 60)		structure	26
List_of_L2C_Mie_Quality_Params	Structure containing all the L2C-derived quality information related to the M_Mie HLOS wind profiles associated with the current observation (i.e. error estimates, validity flags...). See Table 62 .		list of M_Mie structures	11465
List_of_L2C_Rayleigh_Quality_Params	Structure containing all the L2C-derived quality		list of	11465

	ADM-Aeolus Level-2B/2C Processor Input/Output Data Definitions (IODD) ICD		Ref: AE-IF-ECMWF-L2BP-001 Version: 1.40 (Draft A) Date: 30 Nov 2008	
		information related to the M_Rayleigh HLOS wind profiles associated with the current observation (i.e. wind velocities, validity flags...). See Table 68 .		M_Rayleigh structures
Spare				20
Total size in bytes				22982

Table 60: L2C Assimilation Product Confidence Data L2B_Input_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Obs_Screening	A code describing a problem which prevent using this whole BRC (see Table 61 for a list of valid values).		IntAuc	1
L2B_Obs_Screening_Flags1 L2B_Obs_Screening_Flags2 L2B_Obs_Screening_Flags3 L2B_Obs_Screening_Flags4 L2B_Obs_Screening_Flags5	5 bytes each holding up to 8 flags, so in total 40 flags to store individual problems detected in the L2B_Obs screening. Bit 1 in byte 1 : TBD Bit 2 in byte 1: TBD ... Bit 3 in byte 4 : TBD ... Bit 8 in byte 5 : TBD		5*IntAuc	5
Spare_1				20
Total size in bytes				26

Table 61: Valid values for the L2B_Obs_Screening field of the L2C Assimilation Product Confidence Data L2B_Input_Screening structure

(The structure is part of Table 60. Values larger than 0 indicate why the whole Obs/BRC is not used. A total of 255 different conditions can be flagged in this way, but only the first one that occurs is reported. Only 3 conditions are defined here but more can be added later without changing the data-structures.)

Numerical value	Name	Condition
File reading related:		
0	L2B_File_OK	L2B file contents seems OK
1	L2B_HDR_Corrupted	L2B file does not match the format definition (a problem was present in one of the headers)
2	L2B_DBL_Corrupted	L2B file does not match the format definition (a problem was present in the binary data block)
...		
Laser related:		
...		
Satellite related:		
...		
Measurement related:		
...		
Combinations:		
...		



Table 62: L2C Assimilation Product Confidence Data List_of_L2C_Mie_Quality_Params Content Description

Name	Description / Comment	Unit	Type	Binary
Obs_Type	Defines whether this observation was classified as cloud, no cloud. 0 : no observation (remember there can be less than M_Mie meaningful profiles in a BRC) 1 : cloudy 2 : clear ...		IntAuc	1
Spare_1	Reserved for a 36-character Obs_Type_String			36
List_of_L2C_Mie_Height_Bin_Quality_Params	Structure containing 24 sub-structures with all the information pertaining to the 24 possible height bins of the profile (see Table 63).		list of 24 structures	2256
Total size in bytes				2293

Table 63: L2C Assimilation Product Confidence Data List_of_L2C_Mie_Height_Bin_Quality_Params Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Mie_Obs_Screening	Structure describing QC parameters resulting from screening of L2B Mie HLOS observations (see Table 64)		Structure	18
Assimilation_Model_PCD	Structure describing product confidence for assimilation model parameters associated with the current observation (see Table 66)		Structure	66
Spare_1				10
Total size in bytes				94

Table 64: L2C Assimilation Product Confidence Data L2B_Mie_Obs_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Mie_Obs_QC	A code describing a problem which prevents use of this Mie observation (see Table 65 for a list of valid values).		IntAuc	1
L2B_Mie_Obs_QC_Flags	Flags describing problems which prevent using this Mie observation. Bit 1 : TBD Bit 2 : TBD ... Bit 8 : TBD		IntAuc	1
Spare_1				16
Total size in bytes				18

Table 65: Valid values for the L2B_Mie_Obs_QC field of the L2C Product Confidence Data L2B_Mie_Obs_Screening structure

Numerical value	Name	Condition
0	L2B_Mie_Obs_OK	L2B Mie observation contents seem OK
1		
2		
3		
4		
5		
6		
7		
8		
...		



Table 66: L2C Assimilation Product Confidence Data L2C_Assimilation_Model_PCD Content Description

Name	Description / Comment	Unit	Type	Binary
HLOS_observation_errors	Structure containing error estimates assumed during L2C processing, for the current L2B HLOS observation. See Table 67 .		Structure	28
Background_hlos	HLOS from the assimilation model background field given in cm/s and rounded to the nearest integer.	cm/s	IntAs	2
Background_hlos_error	Error in cm/s for Background_hlos.	cm/s	IntAus	2
L2B_hlos_reliability	An L2C-derived measure of the reliability of the current L2B HLOS observation		FAdoxy	8
Analysis_hlos	HLOS from the assimilation model analysis field given in cm/s and rounded to the nearest integer.	cm/s	IntAs	2
Zonal_wind_background_error	Error in cm/s for zonal wind from the assimilation model background.	cm/s	IntAus	2
Meridional_wind_background_error	Error in cm/s for meridional wind from the assimilation model background.	cm/s	IntAus	2
Spare_1				20
Total size in bytes				66

Table 67: L2C Assimilation Product Confidence Data HLOS_Observation_Errors Content Description

Name	Description / Comment	Unit	Type	Binary
persistence_error	Persistence error.	cm/s	IntAus	2
representativity_error	Representativity error.	cm/s	IntAus	2
final_error	Final error	cm/s	IntAus	2
estimated_obs_bias	Estimated bias for the current L2B HLOS observation.	cm/s	IntAs	2
Spare_1				20
Total size in bytes				28

Table 68: L2C Assimilation Product Confidence Data List_of_L2C_Rayleigh_Quality_Params Content Description

Name	Description / Comment	Unit	Type	Binary
Obs_Type	Defines whether this observation was classified as cloud, no cloud. 0 : no observation (remember there can be less than M_Rayleigh meaningful profiles in a BRC) 1 : cloudy 2 : clear ...		IntAuc	1
Spare_1	Reserved for a 36-character Obs_Type_String			36
List_of_L2C_Rayleigh_Height_Bin_Quality_Params	Structure containing 24 sub-structures with all the information pertaining to the 24 possible height bins of the profile (see Table 69).		list of 24 structures	2256
Total size in bytes				2293

Table 69: L2C Assimilation Product Confidence Data List_of_L2C_Rayleigh_Height_Bin_Quality_Params Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Rayleigh_Obs_Screening	Structure describing QC parameters resulting from screening of L2B Rayleigh HLOS observations (see Table 70)			18
Assimilation_Model_PCD	Structure describing product confidence for assimilation model parameters associated with the current			66



	observation (see Table 66)			
Spare_1				10
Total size in bytes				94

Table 70: L2C Assimilation Product Confidence Data L2B_Rayleigh_Obs_Screening Content Description

Name	Description / Comment	Unit	Type	Binary
L2B_Rayleigh_Obs_QC	A code describing a problem which prevents use of this Rayleigh observation (see Table 71 for a list of valid values).		IntAuc	1
L2B_Rayleigh_Obs_QC_Flags	Flags describing problems which prevent using this Rayleigh observation. Bit 1 : TBD Bit 2 : TBD ... Bit 8 : TBD		IntAuc	1
Spare_1				16
Total size in bytes				18

Table 71: Valid values for the L2B_Rayleigh_Obs_QC field of the L2C Assimilation Product Confidence Data L2B_Rayleigh_Obs_Screening structure

Numerical value	Name	Condition
0	L2B_Rayleigh_Obs_OK	L2B Rayleigh observation contents seem OK
1		
2		
3		
4		
5		
6		
7		
8		
...		

4.3.6. Mie Vector-Wind Profiles MDS

This dataset is present only in L2C products.

The content of the DSR for the L2C Mie Vector-wind Measurement Data Set (MDS) is detailed in [Table 72](#).

Table 72: L2C Mie Vector-Wind Data Set MDSR Content Description

Name	Description / Comment	Unit	Type	Binary
Start_of_Obs_Time	Start date and time of the observation or BRC covered by the present DSR. This is the same time as in the Geolca-tion ADS repeated here for cross-checking purposes.	UTC	DateTime	12
N_Meas	Number of L1 measurements reported by the L1B product for this BRC. Note this figure may vary from one BRC to the other.		IntAs	2
N_Obs_Mie_Actual	Number of meaningful Mie profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed M_Mie.		IntAs	2
List_of_Mie_Profiles	Structure containing all the information related to the M_Mie wind profiles associated to the current observation (i.e. wind velocities, validity flags...). See Table 73 .		list of M_Mie structures	3665
Total size in bytes				3681



Table 73: L2C Mie Vector-Wind Data List_of_Mie_Profiles Content Description

Name	Description / Comment	Unit	Type	Binary
Obs_Type	Defines whether this observation was classified as cloud, no cloud. 0 : no observation (remember there can be less than M_Mie meaningful profiles in a BRC) 1 : cloudy 2 : clear ...		IntAuc	1
Spare_1	Reserved for a 36-character Obs_Type_String			36
List_of_Mie_Height_Bin_VecWinds	Structure containing 24 sub-structures with all the information pertaining to the 24 possible height bins of the profile (see Table 74).		list of 24 structures	696
Total size in bytes				733

Table 74: L2C Mie Vector-Wind Data List_of_Mie_Height_Bin_VecWinds and Rayleigh Wind Data List_of_Rayleigh_Height_Bin_VecWinds Content Description

Name	Description / Comment	Unit	Type	Binary
Validity_Flag	Validity flag (1 or TRUE = valid, 0 or FALSE = invalid) attached to the reported wind height bin velocity.		Boolean	1
Background_Zonal_Wind_Velocity	Background zonal wind velocity given in cm/s and rounded to the nearest integer.	cm/s	IntAs	2
Background_Meridional_Wind_Velocity	Background meridional wind velocity given in cm/s and rounded to the nearest integer.	cm/s	IntAs	2
Analysis_Zonal_Wind_Velocity	Analysis zonal wind velocity given in cm/s and rounded to the nearest integer.	cm/s	IntAs	2
Analysis_Meridional_Wind_Velocity	Analysis meridional wind velocity given in cm/s and rounded to the nearest integer.	cm/s	IntAs	2
Spare_1				20
Total size in bytes				29

4.3.7. Rayleigh Vector-Wind Profiles MDS

This dataset is present only in L2C products.

The content of the DSR for the L2C Rayleigh Vector-wind Measurement Data Set (MDS) is detailed in Table 75.

Table 75: L2C Rayleigh Vector-Wind Data Set MDSR Content Description

Name	Description / Comment	Unit	Type	Binary
Start_of_Obs_Time	Start date and time of the observation or BRC covered by the present DSR. This is the same time as in the Geolocation ADS repeated here for cross-checking purposes.	UTC	DateTime	12
N_Meas	Number of L1 measurements reported by the L1B product for this BRC. Note this figure may vary from one BRC to the other.		IntAs	2
N_Obs_Rayleigh_Actual	Number of meaningful Rayleigh profiles in this BRC. Note this figure may vary from one BRC to the other but will not exceed M_Rayleigh.		IntAs	2
List_of_Rayleigh_Profiles	Structure containing all the information related to the M_Rayleigh wind profiles associated to the current observation (i.e. wind velocities, validity flags...). See Table 76 .		list of 5 structures	3665
Total size in bytes				3681



Table 76: L2C Rayleigh Vector-Wind Data List_of_Rayleigh_Profiles Content Description

Name	Description / Comment	Unit	Type	Binary
Obs_Type	Defines whether this observation was classified as cloud, no cloud. 0 : no observation (remember there can be less than M_Rayleigh meaningful profiles in a BRC) 1 : <u>cloudy</u> 2 : <u>clear</u> ...		IntAuc	1
Spare_1	Reserved for a 36-character Obs_Type_String			36
List_of_Rayleigh_Height_Bin_Vec Winds	Structure containing 24 sub-structures with all the information pertaining to the 24 possible height bins of the profile (see Table 74).		list of 24 structures	696
Total size in bytes				733

4.4. File Size

The overall organization and size is summarized in Table 77.

Assuming there are 200 BRCs in the L2B/L2C product file, N_Meas=67 and M_Mie and M_Rayleigh (maximum number of Mie and Rayleigh profiles for each BRC) both equal 5, the total sizes of the L2B/L2C product DataBlock components are

MPH:	1 247 bytes	
SPH:	4 297 (L2B)	5 799 (L2C)
Geolocation and AOCS ADS:	2 908 000	
PCD ADS:	11 959 000	
Mie HLOSwind MDS:	1 221 400	
Rayleigh HLOSwind MDS:	1 605 400	
L2B Total:	17 699 344 bytes.	
Assimilation PCD ADS:		4 596 400
Mie Vector-Wind MDS:		736 200
Rayleigh Vector-Wind MDS:		736 200
L2C Total:		23 769 646 bytes.

Table 77: Overall organization of L2B output and input products.

The attached datasets are L2B output, referenced datasets are L2B input.
Daily sizes in the last column based on 16 orbits / day.

DS name	Content description	Type	Format	Size / day (Mb)	
				Best	Worst
Geolocation ADS	Data set containing the space and time location of all L2B/C Mie and Rayleigh wind observations, the direction of the line-of sight, the satellite velocity and the intersection point with the DEM	Attached	Binary	44	
PCD ADS	Data set containing the quality control and prod-	Attached	Binary	183	



	uct confidence indicators for the L2B products				
Mie MDS	Measurement data set containing Mie HLOS wind observations	Attached	Binary	19	
Rayleigh MDS	Measurement data set containing Rayleigh HLOS wind observations corrected from pressure, temperature and Mie contamination effects + sensitivity coefficients to pressure and temperature	Attached	Binary	25	
L2B DataSets Total				271	
Assimilation PCD ADS	Data set containing the L2C-related assimilation product confidence indicators for the L2C products	Attached	Binary	70	
Mie Vector-Wind MDS	Measurement data set containing Mie vector wind observations	Attached	Binary	11	
Rayleigh Vector-Wind MDS	Measurement data set containing Rayleigh vector wind observations	Attached	Binary	11	
L2C DataSets Total				363	
Aux Met MDS	Measurement data set that contains all the meteorological data needed for re-processing L1B data at the code PDS. These data characterize the thermodynamic state of the atmosphere inside the atmospheric volumes sensed by the lidar. They are obtained from a numerical weather prediction model (for example during a meteorological analysis). At ECMWF, one file is produced every assimilation cycle, that is, every 12 hours	Referenced	Binary	13	106
Aux L2B_Param ADS	Data set containing L2B processor settings.	Referenced	XML	0.02	
Aux RBC ADS	Data set containing the Rayleigh Brillouin look-up tables	Referenced	Binary	29 (approximately once per week)	

The Aux Met DS is based on 60 model layers per profile, as employed in current test versions. Future versions will use 91 layers. For sizing purposes at the time Aeolus is in orbit, 120 layers could be realistic, and so the DBL size should be scaled proportionately (i.e. doubled).

5. Input Auxiliary Files

5.1. Auxiliary Meteorological Data Set.

Auxiliary Meteorological Data (AMD) are an input to the L2B processor. They contain all the meteorological parameters that are needed for running the L2B processor in re-processing mode, e.g. at the Core PDS. They are stored in a separate, independent file referenced in the header section of the main L2B product file.

AMD are a product of Aeolus support processing which will take place at the L2-PF (ECMWF) and potentially at other sites such as national weather services. The AMD products created at ECMWF, and subsequently available from the LTA, typically cover the time period of one assimilation window. At ECMWF, these windows are either 9 → 21UTC or 21 → 9UTC the next day.

Each file contains four data sets:

- GeoADS#1: contains the geolocation information for all the meteorological parameters necessary for (re-)processing off-nadir L1B measurements.
- GeoADS#2: contains the geolocation information for all the meteorological parameters necessary for (re-)processing nadir L1B measurements.
- MetDS#1: contains the meteorological parameters for off-nadir L1B measurements. GeoADS#1 and MetDS#1 contain the same number of records.
- MetDS#2: contains the meteorological parameters for nadir L1B measurements. GeoADS#2 and MetDS#2 contain the same number of records.

For further details on the use of Auxiliary Meteorological Data, see [\[RD1\]](#). Details of their use in L2A processing and L1 calibration processing are beyond the scope of L2B documents.

The geolocation datasets GeoADS#1 and GeoADS#2 specify the horizontal location (latitude and longitude) of each profile in the corresponding MetDS. Each DSR in MetDS#1 and MetDS#2 contains details of the vertical coordinate and vertical profiles of meteorological parameters. The vertical profiles of auxiliary met data are given as a function of the pressure for the vertical coordinate. The pressure layers are those of the NWP model. To allow for an easy conversion of pressure layers into altitudes, vertical profiles of geopotential heights are included in the data set records.

5.1.1. Product Structure

The AMD product conforms to the product structure defined in Section 3.3.

5.1.1.1. File Name

The Auxiliary Meteorological Data file name has the format defined in Section 3.1:

AE_CCCC_AUX_MET_ss_yyyymmddThhmmss_yyyymmddThhmmss_vvvv.EEE



The extension `EEE` is `HDR` for the header and `DBL` for the data block. That is, the AMD product consists of two files:

- A header containing a Fixed Header, MPH, and SPH with DSDs. The header is in XML format and has extension `EEE='HDR'`.
- A datablock containing a copy of MPH and SPH in KVT format followed by the DataSets in binary format. The data block has the file extension `EEE='DBL'`.

Consistent with [AD5], AMD created at ECMWF will set `CCCC='OPER'` and `ss='12'`. The latter setting is used to indicate that AMD can be used in Level 1 (calibration) processing and Level 2A/2B processing. There is scope for others, notably Met Centres other than ECMWF, to generate alternative AMD distinguished by different settings for 'CCCC'.

5.1.1.2. File Structure

The Header File contains a Fixed Header and a Variable Header. The Variable Header contains the MPH as described in Section 3.3 and the AMD SPH. The AMD SPH is described in Section 5.1.2 below. The Data Sets in the datablock are described in Section 5.1.3.

Note: a common MPH is retained for all auxiliary data files, but some parameters may in future be set to a "missing value" (GSDR RID 166).

5.1.2. Specific Product Header

The Specific Product Header of the L2B AMD is detailed in Table 78.

Table 78: L2B Auxiliary Meteorological Data Specific Product Header Content Description

Name	Description / Comment	Unit	Type	Size (KVT)	Size (XML)
Specific_Product_Header	Root tag (XML format only).		Structure	N/A	26 0 27
Sph_Descriptor	Specific Product Header descriptor: ASCII string describing the product		String	16 28 2	16 28 18
Spare_1			Spare	40 0 1	10 0 11
Ref_NWP_Suite	Reference of the NWP suite that was used to produce the met data.		String	15 20 2	15 20 17
Fcst_Initial_Time	Forecast initial date and time	UTC	DateTime	19 27 2	19 30 21
Model_Timestep	Model integration timestep	s	IntAI	15 11 4	16 11 18
Model_Grid_Type	Model grid type. 'GF' or 'GR' indicates full or reduced Gaussian grid, 'SH' indicates spherical harmonics 'LL' indicates a regular grid with fixed latitude and longitude spacing		Enum	16 2 1	17 2 19
Model_Resol_Par1	Model resolution parameter 1. 'SH' or 'GF' or 'GR': truncature ; 'LL': latitude spacing		IntAs	17 6 1	18 6 20
Model_Resol_Par2	Model resolution parameter 2. 'SP' or 'GF' or 'GR': stretching, if any; 0 otherwise ; 'LL': longitude spacing		IntAs	17 6 1	18 6 20
Num_of_Model_Layers	Number of pressure layers for AMD profiles		IntAus	20 6 1	21 5 23
Num_Records_in_DS1	Total number of records in GeoADS#1 or MDS#1 (off-nadir met profiles).		IntAI	19 11 1	20 10 22
Num_Records_in_DS2	Total number of records in GeoADS#2 or MDS#2 (nadir met profiles).		IntAI	19 11 1	20 10 22
Num_Avail_L1B_Obs	Number of L1B observations that were available at the time the assimilation was started.		IntAI	18 11 1	19 10 21
Num_Missing_L1B_Obs	Number of L1B observations that were missing at the time the assimilation was started.		IntAI	20 11 1	21 10 23



Num_Computed_Locations	Number of profile locations computed from predicted orbit tracks to compensate for missing L1B observations.		IntAI	23	11	1	24	10	26
Spare_2			Spare	40	0	1	10	0	11
Num_Input_Files	Number of input files that were used for obtaining locations for computation of AMD. Input files are either L1B (WVM) files or predicted orbit files. This field is unlikely to exceed 10.		IntAus	16	6	1	17	5	19
Num_Files_Predict_Orbit	Number of predicted orbit files that were used for computing expected L1B profile locations and corresponding AMD. If no L1B data was missing, this field is zero. This field must not exceed Num_Input_Files.		IntAus	24	6	1	25	5	27
Spare_3			Spare	40	0	1	10	0	11
List_of_Dsds	See Table 79 for a description. The size estimates given here are for Num_Input_Files=10, which is unlikely to be exceeded.			4032			5180		
Total size for KVT and XML in bytes				4623			6066		

5.1.2.1. DATA SET DESCRIPTORS

The Data Sets listed in [Table 79](#) appear in Aeolus AMD products, each described by a DSD in the SPH.

Table 79: Auxiliary Meteorological Data Sets

DSD Number	Name	Description / Comment	DataSet Type	Update Frequency
1	GeoADS#1	DSD for Geolocation & AOCS data (off-nadir, one DSR / profile). See Table 80 for a description.	A	1 DSR per profile
2	GeoADS#2	DSD for Geolocation & AOCS data (nadir, one DSR / profile). See Table 80 for a description.	A	1 DSR per profile
3	MetDS#1	DSD for Meteorological Data (off-nadir, for re-processing etc, one DSR / profile). See Table 81 for a description.	A	1 DSR per profile
4	MetDS#2	DSD for Meteorological Data (nadir, one DSR / profile). See Table 81 for a description.	A	1 DSR per profile
5 to (4+Num_Input_Files)	Input_DS#1 to Input_DS#Num_Input_Files	DSD for each input file used for obtaining locations for computation of AMD. The first (Num_Input_Files-Num_Files_Predict_Orbit) DSDs correspond to actual L1B product files, the last Num_Files_Predict_Orbit DSDs correspond to predicted orbit files.	R	No DS

A description of the “Data Set Type” can be found in [Table 10](#). Note that only the first four datasets are of type ‘A’, or ‘Attached’, meaning that they are included in the AMD datablock file. Their content is described in [Section 5.1.3](#).

5.1.3. Data Sets

5.1.3.1. GEOLOCATION ADS

The Geolocation Annotation Data Sets (GeoADS) #1 and #2 are described in [Table 80](#).



Table 80: L2B Auxiliary Meteorological Data Geolocation Data Set #1 and #2 ADSR Content Description.

Note that AMD_zg shall be removed following confirmation that geoid height will be supplied in L1B data.

Name	Description / Comment	Unit	Type	Size (Binary)
AMD_DateTime	Date and time	UTC	DateTime	12
AMD_Latitude	Latitude of the whole profile.	10-6degN	IntAI	4
AMD_Longitude	Longitude of the whole profile.	10-6degE	IntAI	4
AMD_zg	Geoid height above WGS84 reference ellipsoid	cm	IntAI	4
Total size in bytes				24

5.1.3.2. METEOROLOGICAL MDS

The Meteorological Data Sets (MetDS) #1 and #2 are described in Table 81.

The only parameters of the Meteorological Data Set to be used in baseline L2B processing are those related to Rayleigh-Brillouin corrections, i.e. parameters relating to temperature, pressure, and geopotential height. The other parameters may be used in optional extensions to baseline L2B processing, and in L2A processing.

Table 81: L2B Auxiliary Meteorological Data Meteorological Set #1 and #2 MDSR Content Descriptor

Name	Description / Comment	Unit	Type	Size (Binary)
Spare_1			Spare	2
AMD_us	East-West wind component at the surface (>0 to East). This information can be used for qualifying Mie wind in ground echo-height-bins.	cm/s	IntAs	2
AMD_vs	North-South wind component at the surface (>0 to North). This information can be used for qualifying Mie wind in ground echo-height-bins.	cm/s	IntAs	2
AMD_ps	Surface pressure. May be used for detecting severe events like tropical cyclones.	Pa	IntAul	4
AMD_err_ps	Std error on AMD_ps	Pa	FAdo62	8
AMD_zs	Geopotential height at pressure AMD_ps. Gives the altitude of the surface according to the weather model.	cm	IntAI	4
Spare_2			Spare	2
List_of_Profile_Data	List of Num_of_Model_Layers substructures each containing the meteorological data constituting the vertical profile. Each substructure corresponds to one model layer (see Table 82).		list of structures	4260
Spare_3			Spare	2
Total size in bytes				4286

Table 82: L2B Auxiliary Meteorological Data List_of_Profile_Data Content Descriptor

Name	Description / Comment	Unit	Type	Size (Binary)
AMD_Validity_Flag	0' for a valid level with a complete set of AMD data with all parameters extracted from the NWP model ; '-1' for an incomplete level containing at least valid temperature, valid pressures, and valid heights ; '-2' otherwise. Other flags could be added later		IntAc	1
AMD_pbase	Pressure at the bottom of the model layer	Pa	IntAul	4
AMD_ptop	Pressure at the top of the model layer	Pa	IntAul	4
AMD_pnom	Nominal pressure within the model layer, can differ from (AMD_pbase+AMD_ptop)/2.	Pa	IntAul	4
AMD_zbase	Geopotential height at pressure AMD_pbase	cm	IntAI	4
AMD_ztop	Geopotential height at pressure AMD_ptop	cm	IntAI	4
AMD_znom	Geopotential height at pressure AMD_pnom	cm	IntAI	4
AMD_T	Temperature at pressure AMD_pnom	10-2K	IntAus	2
AMD_err_T	Std error on AMD_T	10-2K	IntAus	2



AMD_u	East-West wind velocity (>0 to East)	Cm/s	IntAs	2
AMD_v	North-South wind velocity (>0 to North)	Cm/s	IntAs	2
Spare_1			Spare	4
AMD_rh	Relative humidity at pressure AMD_pnom	%	IntAuc	1
AMD_err_rh	Std error on AMD_rh	%	FAdo22	8
AMD_q	Specific humidity at pressure AMD_pnom	kg/kg	FAdo26	8
AMD_cc	Cloud cover at pressure AMD_pnom	%	IntAuc	1
AMD_clwc	Cloud liquid water content at pressure AMD_pnom	kg/kg	FAdo62	8
AMD_ciwc	Cloud ice water content at pressure AMD_pnom	kg/kg	FAdo62	8
Total size in bytes				71

5.1.4. File Size

The total size for Auxiliary Meteorological Data products is summarized in Table 83 on the basis of a number of model pressure levels equal to 60. Two extremes of size are considered. The best, i.e. smallest size, option (left column) is when all L1B data are available. Then GeoADS#2 and MDS#2 are empty and there are 200 records per orbit (15 orbits per day). The worst, i.e. largest size, option is when no L1B data are available. Then both nadir and off-nadir data sets must be filled, and there are 800 records in each dataset per orbit.

Table 83: Size of L2B Auxiliary Meteorological Data file.

One file is produced every time an assimilation is run, that is, every 12 hours.

	Section	Format	Size (best case) per file	Size (worst case) per file
Header File	FH	XML	699	
	MPH	XML	1582	
	SPH	XML	6066	
Total size in bytes for HDR file			8470	
Data Block	MPH	KVT	1247	
	SPH	KVT	4623	
	GeoADS#1	Binary	38400	153600
	GeoADS#2	Binary	0	153600
	MDS#1	Binary	6857600	27430400
	MDS#2	Binary	0	27430400
Total size in bytes for DBL file			6901870	55173870
Total size for HDR+DBL in Mb			6,58	52,63

Note that the Aux Met DS size estimate is based on 60 model layers per profile, as employed in current test versions. Future versions will use 91 layers. For sizing purposes at the time Aeolus is in orbit, 120 layers could be realistic, and so the DBL size should be scaled proportionately (i.e. doubled).

5.2. Rayleigh-Brillouin Correction (RBC) tables

Rayleigh-Brillouin correction tables are contained in the AUX_RBC_L2 data product. The tables have to be re-computed each time an Instrument Spectral Registration (ISR) or Instrument Auto Test (IAT) is performed [RD5]. In conjunction with AUX_MET data, they provide the means to correct for temperature and pressure effects in L2B HLOS wind retrieval. By default, the most recent product should be used in L2B processing. The remainder of this section is now obsolete; the definitive IODD for the AUX_RBC_L2 file format is [RD8].



5.2.1. Product Structure

See [\[RD8\]](#).

5.2.1.1. FILE NAME

The RBC Data file name has the format defined in Section 3.1:

AE_CCCC_AUX_RBC_L2_yyyymmddThhmmss_yyyymmddThhmmss_vvvv.EEE

The extension EEE is HDR for the header and DBL for the data block. That is, the RBC product consists of two files:

- A header containing a Fixed Header, MPH, and SPH with DSDs. The header is in XML format and has extension EEE='HDR'.
- A datablock containing a copy of MPH and SPH in KVT format followed by the DataSets in binary format. The data block has the file extension EEE='DBL'.

5.2.1.2. FILE STRUCTURE

5.2.2. RBC Specific Product Header

Table 84: L2B Rayleigh Brillouin Correction Specific Product Header Content Descriptor

(Table deleted. See [\[RD8\]](#).)

5.2.2.1. DATA SET DESCRIPTORS

Table 85: Rayleigh-Brillouin Correction Data Sets

(Table deleted. See [\[RD8\]](#).)

5.2.3. RBC Data Set

(Tables deleted. See [\[RD8\]](#).)

Table 86: L2B Rayleigh Brillouin Correction Data Set Content Descriptor

Table 87: L2B Rayleigh Brillouin Correction Spec_Grid_PTF Content Descriptor

Table 88: L2B Rayleigh Brillouin Correction Spec_Grid_TF Content Descriptor

Table 89: L2B Rayleigh Brillouin Correction Fcalib_PTR Content Descriptor

Table 90: L2B Rayleigh Brillouin Correction Fcalib_TR Content Descriptor

Table 91: L2B Rayleigh Brillouin Correction Nab_PTFd Content Descriptor

Table 92: L2B Rayleigh Brillouin Correction Nab_TFd Content Descriptor



5.2.4. File Size

The size of the RBC file is about 33 Mb.

Table 93: Size of L2B Auxiliary Rayleigh Brillouin Correction Data file.

(Table deleted. See [\[RD8\]](#).)

5.3. Auxiliary Climatology Dataset

Auxiliary Climatology look-up tables are contained in the AUX_CLM_L2 data product. The initial tables are to be generated by KNMI. These tables will be updated as more spaceborne lidar measurements are collected. They contain values for the extinction-to-backscatter ratio for aerosols as function of location and time of the year.

This input to the L2B processor may also be suitable as an input to L2A processing. Hence a filetype of the form AUX_CLM_2x could be appropriate. Such a file would be updated infrequently, perhaps once per year. A candidate dataset under consideration consists of atmospheric optical properties. An indication of the possible file size is given on the following basis of data from the GLAS instrument:

Optical parameters:	particle extinction-to-backscatter ratio, associated error quantifier	
Vertical layers:	10	
Horizontal grid:	180 x 90 (2 degrees by 2 degrees)	
Temporal resolution:	4 (once per season)	
Datatype:	FAdoxy (8 bytes within a binary DBL)	
Total:	10.5 MB	(Example 1)

Depending on progress with newer satellite data, e.g. CALIPSO, a larger dataset could be envisaged:

Vertical layers:	30	
Horizontal grid:	360 x 180 (1 degree by 1 degree)	
Temporal resolution:	12 (once per month)	
Datatype:	FAdoxy (8 bytes within a binary DBL)	
Total:	363 MB	(Example 2)

However, since at first this file will be used mainly within the L2B processor for classification of the situation where only the FP channel is available, a much coarser resolution will be used for a first version of this file:

Vertical layers:	4	
Horizontal grid:	36 x 18 (10 degrees by 10 degrees)	
Temporal resolution:	4 (once per season)	
Datatype:	IntAI (4 bytes within a binary DBL)	
Total:	192 kB	(Example 3)

5.3.1. Product Structure

The Clim product conforms to the product structure defined in Section 3.3.

5.3.1.1. FILE NAME



The Clim Data file name has the format defined in Section 3.1:

AE_CCCC_AUX_CLM_L2_yyyymmddThhmmss_yyyymmddThhmmss_vvvv.EEE

The extension EEE is HDR for the header and DBL for the data block. That is, the Clim product consists of two files:

- A header containing a Fixed Header, MPH, and SPH with DSDs. The header is in XML format and has extension EEE='HDR'.
- A datablock containing a copy of MPH and SPH in KVT format followed by the DataSets in binary format. The data block has the file extension EEE='DBL'.

5.3.1.2. FILE STRUCTURE

The Header File contains a Fixed Header and MPH as described in Section 3.3. The SPH is described in Section 5.2.2 below. The Data Sets in the datablock are described in Section 5.2.3.

Note: a common MPH is retained for all auxiliary data files, but some parameters may in future be set to a "missing value" (GSDR RID 166).

Note that the chosen file organisation has a large flexibility in defining the grid on which the data is provided. For each season a different grid may be used. For each latitude band the longitude grid may be changed, to allow for example coarser resolution near the poles. For each (date, lat, lon) location a different altitude profile may be specified to allow adapting to a varying height of the PBL, troposphere, stratosphere boundaries, etc. On the other hand a simple regular grid is of course also possible, but for this case the file has some overhead due to multiple copies of the same start/end values (main contribution to this overhead is in StartAltitude and EndAltitude variables which fill about half the bytes of the file). For the envisaged use in the L2BP this is not expected to be a problem since the L2BP will use a coarse resolution with a file size of around 180 kB. When it becomes necessary to go to higher resolutions (with file sizes of several 100 MB) it may be desirable to have this flexibility to save storage space near the poles or in large uniform areas (like in the middle of the oceans).

5.3.2. Clim Specific Product Header

The Specific Product Header of the L2B Clim is detailed in Table 94.

Table 94: Aux Clim Specific Product Header Content Descriptor

Name	Description / Comment	Unit	Type	Size (KVT)	Size (XML)
Sph_Descriptor	Specific Product Header descriptor: ASCII string describing the product		String	16 28 2	15 28 17
Spare_1			Spare	40 0 1	9 0 11
AuxClim_Ref_Name	Reference name to indicate which set of climatological data was used for constructing this look-up-table		String	18 50 2	18 50 20
Spare_2			Spare	40 0 1	9 0 11
List_of_Dsds	List containing a single DSD named "Clim_DSD" for the climatology table (1 DSR only). See Table 95 for a description.			288	357
Total size for KVT and XML in bytes				48486	54545



5.3.2.1. DATA SET DESCRIPTORS

The Auxiliary Climatology data file contains one attached dataset, summarized by the Clim_DSD Data-SetDescriptor of the SPH section defined in Table 94 just above.

A description of the “Data Set Type” can be found in Table 10.

The content of the Climatology dataset is described in Section 5.3.3.

5.3.3. Clim Data Set

The content of the Clim data set is described in Table 95. Where three alternative sizes are given, they correspond to the resolutions of the three examples given in Section 5.3.

Table 95: Climatology Data Set

Name	Description / Comment	Unit	Type	Size (Binary)
Num_DateTime_Ranges	Number of DateTime ranges used by this climatology (Typical values: 4 or 12)		IntAs	2
ClimDateLatLonAlt	List of Num_DateTime_Ranges structures ClimLatLonAlt containing the climatology as a function of Latitude, Longitude and Altitude (see Table 96) for a series of dates		Num_DateTime_Ranges structures	11019704/ 381045912/192632
Total size in bytes				11019706/ 381045914/192634

Table 96: ClimLatLonAlt Data Set

Name	Description / Comment	Unit	Type	Size (Binary)
StartDateTime	start of timerange for which this data should be used	UTC	DateTime	12
EndDateTime	end of timerange for which this data should be used	UTC	DateTime	12
Num_Latitude_Ranges	Number of Latitude ranges used by this climatology (typical value: 18 or 90)		IntAs	2
ClimLatLonAlt	List of Num_Latitude_Ranges structures ClimLonAlt containing the climatology as a function of Longitude and Altitude (see Table 97) for the given date and latitude		Num_Latitude_Ranges structures	2754900/31753800/ 48132
Total size in bytes				2754926/31753826/ 48158

Table 97: ClimLonAlt Data Set

Name	Description / Comment	Unit	Type	Size (Binary)
StartLatitude	start of the latitude range for which this data should be used	10-6DegN	IntAI	4
EndLatitude	end of the latitude range for which this data should be used	10-6DegN	IntAI	4
Num_Longitude_Ranges	Number of Longitude ranges used by this climatology (typical value: 36 or 180)		IntAs	2
ClimLonAlt	List of Num_Longitude_Ranges structures ClimAlt containing the climatology as a function of Altitude (see Table 98) for the given Date, latitude and longitude		Num_Longitude_Ranges structures	30600/176400/2664
Total size in bytes				30610/176410/2674

Table 98: ClimAlt Data Set

Name	Description / Comment	Unit	Type	Size (Binary)
StartLongitude	start of the longitude range for which this data should be used	10-6DegE	IntAI	4
EndLongitude	end of the longitude range for which this data should be used	10-6DegE	IntAI	4



Num_Altitude_Ranges	Number of altitude ranges used by this climatology (typical values 4 or 10)		IntAs	2
ClimAlt	List of Num_Altitude_Ranges structures ClimData containing the climatology (see Table 99) for the given Date, latitude, longitude and altitude.		Num_Altitude_Ranges structures	160/480/64
Total size in bytes				170/490/74

Table 99: ClimData Data Set

Name	Description / Comment	Unit	Type	Size (Binary)
StartAltitude	start of the altitude range for which this data should be used	m	IntAI	4
EndAltitude	stop of the altitude range for which this data should be used	m	IntAI	4
S	extinction-to-backscatter ratio	10-3Sr	IntAI	4
S_stdev	standard deviation in the reported extinction-to-backscatter ratio	10-3Sr	IntAI	4

5.3.4. File Size

The fixed header of the L2B Clim file is detailed in Table 6 and the Main Product Header of the AUX_CLM file is detailed in Table 9. The size of the Clim file varies for the 3 given examples between 0.2, 10 and 360 Mb.

Table 100: Size of Aux Clim file.

	Section	Format	Size per file example 1	Size per file example 2	Size per file example 3
Header File	FH	XML	699	699	699
	MPH	XML	1508	1508	1508
	SPH	XML	545	545	545
Total size in bytes for HDR file			2752	2752	2752
Data Block	MPH	KVT	1247	1247	1247
	SPH	KVT	486	486	486
	AuxClim ADS	Binary	11019706	381045914	192634
Total size in bytes for DBL file			11021439	381047647	194367
Total size for HDR+DBL in Kb			10766	372120	193
Total size for HDR+DBL in Mb			11	364	0.2

5.4. Level-2B Processing Parameters and Algorithm Settings

The Level-2B Processing Parameters file is an auxiliary input to the L2B processor. The file defines the processor settings parameters, including algorithm settings for the L2B processor. It will contain settings for all switches that control the actions performed by the processor, and the algorithm settings needed to define operation of the L2B processor.

5.4.1. Product Structure and Size

The Level-2B Processing Parameters file conforms to the Earth Explorer standard defined in Section 3.3, with an overall structure defined by Table 101. It is contained in one product file, containing Fixed Header and Main Product Header as defined in sections 3.3.1 and 3.3.2 respectively, as well as a Specific Product Header and a single Data Set as defined in the following subsections. All headers and data sets are in XML format.



Note: a common MPH is retained for all auxiliary data files, but some parameters may in future be set to a “missing value” (GSDR RID 166).

In the tables below, all Types denoted FAdoxy have been allocated 10 bytes, i.e. x+y=8.

Table 101: Structure and Size of the L2B Processing Parameters file.

Name	Description / Comment	Type	Size (XML)
Fixed_Header	The default Earth Explorer FH structure, as defined in Table 6 .	Structure	699
Main_Product_Header	The default Earth Explorer MPH structure, as defined in Table 9 .	Structure	1582
Specific_Product_Header	A specific product header, specific for this filetype, as defined in Table 102 .	Structure	<u>4</u> 37
Level_2B_Proc_Params	The datablock containing the actual parameter settings, as defined in Table 103 .	Structure	<u>884</u> 2
Total size for XML in bytes:			<u>11560</u>

5.4.1.1. FILE NAME

The Level 2B Processing Parameters file name has the format

AE_CCCC_AUX_PAR_2B_yyyymmddThhmmss_yyyymmddThhmmss_vvvv.EEF

The date/times (yyymmddThhmmss) represent the start and stop of the validity period. This validity period will generally extend over a long period of time, each validity period representing different phases of the ADM-Aeolus mission, over which the properties of the satellite may change. The version number combined with the date makes this a unique instance of the file.

This product file has an extension .EEF to designate a single file in XML format.

5.4.1.2. FILE STRUCTURE

5.4.2. Specific Product Header

The Specific Product Header section of the AUX_PAR_2B XML file is defined in Table 102.

Table 102: Structure and content of the Specific Product Header of the AUX_PAR_2B file

Tag Name	Content Description	Unit	Type	Size (XML)
Sph_Descriptor	ASCII string describing this collection of settings		String	80
List_of_DSDs	A list of DSD's following the default Earth Explorer DSD structure, as defined in Table 10 , describing the attached data set. (There is just 1 DSD in this list)			344
Total size for XML in bytes:				<u>4</u>24

5.4.3. Data Set Descriptor

Only a single Data Set appears in the Aeolus Level 2B Processing Parameters data file: the Level 2B Processing Parameters GADS, as described below.

5.4.4. Level 2B Processing Parameters GADS

Table 103: Level 2B Processing Parameters GADS Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
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FH_Default_Fields	Fields responsible for populating the Fixed Header. See Table 104 for the structure definition.		Structure	436
MPH_Default_Fields	Fields responsible for populating the Main Product Header. See Table 105 for the structure definition.		Structure	153
WVM_Params	Processing Parameters for the Wind Velocity Measurements. See Table 106 for the structure definition.		Structure	3524
Screening_Params	Collected Screening Parameters used for testing the input files and the generated results. See Table 120 for the structure definition.		Structure	4729
Total size for XML in bytes:				8842

Table 104: FH_Default_Fields Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
File_Description	1-line description of the file		String	63
Notes	Multi-lines free text		String	41
Mission	Aeolus		String	45
Mission_Id	AE		String	51
File_Class	1-line description of file class		String	51
File_Version	4 digits used to distinguish between versions of a file having the same validity period		IntAs	36
System	Aeolus L2BP		String	43
Creator	Aeolus L2BP		String	45
Creator_Version	Version of the tool		String	61
Total size for XML in bytes:				436

Table 105: MPH_Default_Fields Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Ref_Doc	Reference document describing the product		String	45
Software_Ver	Software version number of processing software. Format: name of processor (up to 10 char) and version number (4 char)		String	55
Proc_Center	Name of Processing Center		String	53
Total size for XML in bytes:				153

Table 106: WVM_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
File_Type	File Type String		String	49
Sph_Descriptor	ASCII string describing the product		String	59
Warmup_Pulse_Min_Height	Height below which the warmup pulses may not be used	m	FAdoxy	62
Rangebin_Mismatch_Tolerance	Tolerance beyond which Mie and Rayleigh rangebins are considered mismatched.	m	FAdoxy	66
Line_of_Sight_Wind_Flag	Flag indicating whether the horizontal or line-of-sight wind component should be reported.		Boolean	57
Mie_Ground_Correction_Weighting_Factor	Replaced by ZWC_Params			
Rayleigh_Ground_Correction_Weighting_Factor	Replaced by ZWC_Params			
N_Obs_Mie_Max	Maximum number of observations that may be generated for the Mie channel		IntAuc	35
N_Obs_Rayleigh_Max	Maximum number of observations that may be generated for the Rayleigh channel		IntAuc	45
Classification_Params	Parameters for the Classification algorithm. See Table 107 for the structure definition		Structure	632
Optical_Properties_Params	Parameters for the algorithms determining the optical properties of the atmosphere. See Table 110 for the structure definition.		Structure	160
Error_Quantifier_Params	Parameters for the algorithms determining the Error properties of the reported wind results. See Table 112 for structure information.		Structure	160
Common_Processing_Params	Common Processing Parameters. See Table 115 , for structure information. This definition will change in line with future updates of [RD4, table 4-2].		Structure	978
RBC_Algorithm_Params	Parameters used by the RBC algorithm. See Table 119 for structure information		Structure	55



AMD_Matchup_Params	Parameters used by the L1B-AMD matchup algorithm. See Table 126 for structure information		Structure	208
CLM_Matchup_Params	Parameters used by the L1B-CLM matchup algorithm. See Table 128 for structure information		Structure	80
ZWC_Params	Parameters used to specify the L2B Zero-Wind Correction. See Table 130 for structure information			878
Total size for XML in bytes:				3524

Table 107: Classification_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Classification_Type_Mie	the classification type for the Mie channel. See Table 108 for valid values		Enum	80
Classification_Type_Rayleigh	the classification type for the Rayleigh channel. See Table 108 for valid values		Enum	80
List_of_BackscatterRatio_Thresholds	List of BackscatterRatio_threshold structures to be used for classification of a rangebin using a threshold on the backscatter ratio. See Table 109 for structure definition.		List of 2 structures	236
List_of_Exinction_Thresholds	List of Extinction_threshold structures to be used for classification of a rangebin using a threshold on the extinction value. See Table 109 for structure definition.		List of 2 structures	236
Total size for XML in bytes:				632

Table 108: Valid Classification types

Classification Type	Description
Class_No_Clouds	Classification by assuming no clouds everywhere
Class_Copy_E2S_Input	Classification by copying the input used for the E2S (only valid for TEST product file class)
Class_Ext_Threshold	Classification by setting a threshold on the extinction
Class_Cal_Mie_Threshold	Classification by setting a threshold on the Mie backscatter value
Class_Rayleigh_Slope	Classification by setting a Threshold on the slope of the Rayleigh backscatter profile
Class_Mie_Slope	Classification by setting a Threshold on the slope of the Mie backscatter profile
Class_Backscat_Ratio	Classification by setting a threshold on the backscatter ratio
Class_Adjacent_Mie_Backscatter	Classification by setting a Threshold on the ratio of the Mie backscatter in adjacent rangebins
Class_Adjacent_Rayleigh_Backscatter	Classification by setting a Threshold on the ratio of the Rayleigh backscatter in adjacent rangebins

Table 109: BackscatterRatio_Threshold and Extinction_Threshold content description

Tag Name	Content Description	Unit	Type	Size (XML)
Threshold_Value	Thresholds to be used for classification of a rangebin	BackscatterRatio: unitless. Extinction: m ⁻¹ .	FAdoxy	66
Altitude	Altitude at which Threshold_Value is valid	Km	FAdoxy	52
Total size for XML in bytes:				118

Table 110: Optical_Properties_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
ScatRatio_Method	the method to be used to get the scattering ratio. See Table 111 for valid values		Enum	80
ScatRatio_Method2	A backup method to get the scattering ratio, to be used when ScatRatio_Method gives no result, i.e. returns a missing_data indicator. See Table 111 for valid values.		Enum	80
Total size for XML in bytes:				160

Table 111: Valid methods for determining backscatter ratio

Backscatter ratio method	Description
Scat_Ratio_from_L1B	Get the backscatter ratio value from the L1B input file (available for Mie rangebins only)
Scat_Ratio_from_MieRayl	Get the backscatter ratio value by comparing the Mie and Rayleigh usefull signal
Scat_Ratio_from_RaylOnly	Get the backscatter ratio value from the extinction value determined for the Rayleigh channel, by assuming a backscatter-to-extinction ratio for the particle backscatter.



Scat_Ratio_Dont_Use	don't determine the backscatter ratio (only allowed if this ratio is not used by the classification scheme, or for ScatRatio_Method2 if no backup method is needed)
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Table 112: Error_Quantifier_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
ErrorQuantMethod_Mie	The method to be used to calculate the Error quantifier for the Mie channel. See Table 113 for valid values		Enum	80
ErrorQuantMethod_Rayleigh	The method to be used to calculate the Error quantifier for the Rayleigh channel. See Table 114 for valid values		Enum	80
Total size for XML in bytes:				160

Table 113: Valid methods for determining Error Quantifier for the Mie channel

Mie ErrorQuantifier method	Description
ErrorQuantMethod_Mie_1Bweighted	description tbd
ErrorQuantMethod_Mie_core_sens	description tbd

Table 114: Valid methods for determining Error Quantifier for the Rayleigh channel

Rayleigh ErrorQuantifier method	Description
ErrorQuantMethod_Ray_1Bweighted	description tbd
ErrorQuantMethod_Ray_iliad_sens	description tbd

Table 115: Common_Processing_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Mie_PCD_Params	Processing parameters for Mie product confidence params SNR and backscatter-ratio. See [RD4, table 4-3], copied below as Table 116 , for structure definition.		Structure	111
Mie_Core_Algorithm_Params	Processing parameters for Mie Core Algorithm. See Table 117 , for structure definition. This definition will change in line with future updates of [RD4, table 4-4].		Structure	693
Corrupt_Data_Detection_Params	Parameters for corrupt data detection. See [RD3, table 8-56], copied below as Table 118 , for structure definition.		Structure	174
Total size for XML in bytes:				978

Table 116: Mie_PCD_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Alpha_Correction	Correction factor for the calculation of the Mie SNR		FAdoxy	46
Summation_Index	Summation index for calculation of SNR and backscatter ratio		IntAul	36
Total size for XML in bytes:				82

Table 117: Mie_Core_Algorithm_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
SNR_Threshold	Threshold to switch Mie-Core processing on/off.		FAdoxy	40
Start_FWHM	Starting value for FWHM	ACCD pixel (index)	FAdoxy	34
Residual_Error_Threshold	Stop threshold for quadratic sum of differences between modeled and measured ACCD counts per pixel	A.U. (i.e. Unitless)	FAdoxy	62
Max_Iterations_Lorentz_Fit	Maximum number of iterations in Lorentz fit-loop		IntAuc	58
FWHM_Upper_Threshold	Upper threshold for FWHM of Lorentz function for quality check	ACCD pixel	FAdoxy	54
FWHM_Lower_Threshold	Lower threshold for FWHM of Lorentz function for quality check	ACCD pixel	FAdoxy	54
Peak_Height_Upper_Threshold	Relative (upper) threshold for peak height of Lorentz function	ACCD counts	FAdoxy	64
Peak_Height_Lower_Threshold	Relative (lower) threshold for peak height of Lorentz function	ACCD counts	FAdoxy	64
Peak_Location_Threshold	Peak location threshold	ACCD Pixel	FAdoxy	56



Nonlinear_Optimization_Threshold	Stop threshold for Downhill Simplex algorithm merit function	A.U. (i.e. Unitless)	FAdoxy	74
Max_Iterations_Nonlinear_Optimization	Maximum number of iterations of Downhill Simplex algorithm	A.U. (i.e. Unitless)	IntAul	79
Num_Spectral_Sub_Samples	Number of functional evaluations of Lorentz fit function for one pixel	A.U. (i.e. Unitless)	IntAul	54
Total size for XML in bytes:				693

Table 118: Corrupt_Data_Detection_Params_Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Max_Signal_Derivative	Maximum signal derivative. Maximum valid pixel intensity difference between adjacent CCD pixels.	PixelLevel	IntAus	52
Pixel_Saturation_Threshold	Pixel saturation threshold	PixelLevel	IntAus	62
Total size for XML in bytes:				114

Table 119: RBC_Algorithm_Params_Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Do_Mie_Decontamination	Switch to select whether Mie_Decontamination should be done in the L2BP or not (i.e. if it is not already done in the L1BP)		Boolean	55
Total size for XML in bytes:				55

Table 120: Screening_Params_Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L1B_Screening_Params	Parameters used for screening the L1B input file. See Table 121 for the structure definition.		Structure	4561
L2B_AMD_Screening_Params	Parameters used for screening the L2B_AMD input file. See Table 125 for the structure definition.		Structure	168
Total size for XML in bytes:				4729

Table 121: L1B_Screening_Params_Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L1B_Obs_Screening_Params	Parameters used for screening the L1B observations from the L1B input file. See Table 122 for the structure definition.		Structure	1733
L1B_Mie_Meas_Screening_Params	Parameters used for screening the L1B Mie Measurements from the L1B input file. See Table 123 for the structure definition.		Structure	1547
L1B_Rayleigh_Meas_Screening_Params	Parameters used for screening the L1B Rayleigh Measurements from the L1B input file. See Table 124 for the structure definition.		Structure	1281
Total size for XML in bytes:				4561

Table 122: L1B_Obs_Screening_Params_Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L1B_Laser_Freq_Unlocked_Threshold	Threshold on the value of nmeas with laser_freq_unlocked (see element 10 in table 17 of section 5.3 of TN2.1)		IntAI	83
L1B_Ref_Pulses_Unlocked_Threshold	Threshold on the value of nrefpulses with laser_freq_unlocked (see element 11 in table 17 of section 5.3 of TN2.1)		IntAI	83
L1B_Laser_Freq_Offset_Threshold	Threshold on the value of average laser freq. offset (see element 12 in table 17 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	84
L1B_Laser_UV_Energy_Threshold	Threshold on the value of average laser UV energy (see element 13 in table 17 of section 5.3 of TN2.1)	mJ	FAdoxy	74
L1B_Laser_Freq_Offs_Stdev_Threshold	Threshold on the value of Standard deviation for laser frequency offset (see element 14 in table 17 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	92
L1B_Laser_UV_Energy_Stdev_Threshold	Threshold on the value of Standard deviation for laser pulse UV energy (see element 15 in table 17 of section 5.3 of TN2.1)	mJ	FAdoxy	86



	5.3 of TN2.1)			
L1B_Mie_Mean_Emit_Freq_Min	Minimum allowed value for Mie mean emitted frequency (see element 16 in table 17 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	64
L1B_Mie_Mean_Emit_Freq_Max	Maximum allowed value for Mie mean emitted frequency (see element 16 in table 17 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	74
L1B_Mie_Emit_Freq_Stdev_Threshold	Threshold on the value of Mie emitted frequency standard deviation (see element 17 in table 17 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	88
L1B_Rayleigh_Mean_Emit_Freq_Min	Minimum allowed value for Rayleigh mean emitted frequency (see element 18 in table 17 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	84
L1B_Rayleigh_Mean_Emit_Freq_Max	Maximum allowed value for Rayleigh mean emitted frequency (see element 18 in table 17 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	84
L1B_Rayleigh_Emit_Freq_Stdev_Threshold	Threshold on the value of Rayleigh emitted frequency standard deviation (see element 19 in table 17 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	98
L1B_Sat_Not_on_Target_Threshold	Threshold on the value of nmeas with sat_not_on_target (see element 20 in table 17 of section 5.3 of TN2.1)		IntAI	79
L1B_Mie_corrupt_Threshold	Threshold on the value of nmeas with corrupt Mie meas. (see element 30 in table 17 of section 5.3 of TN2.1)		IntAI	67
L1B_Rayleigh_corrupt_Threshold	Threshold on the value of nmeas with corrupt Rayleigh meas. (see element 31 in table 17 of section 5.3 of TN2.1)		IntAI	77
L1B_Mie_Ref_Pulses_Corrupt_Threshold	Threshold on the value of nmeas with corrupt Mie ref. Pulses (see element 32 in table 17 of section 5.3 of TN2.1)		IntAI	89
L1B_Rayl_Ref_Pulses_Corrupt_Threshold	Threshold on the value of nmeas with corrupt Rayleigh ref. Pulses (see element 33 in table 17 of section 5.3 of TN2.1)		IntAI	91
L1B_Mie_Invalid_Meas_Threshold	Threshold on the value of num_of_mie_invalid_measurements (see element 40 in table 17 of section 5.3 of TN2.1)		IntAI	77
L1B_Mie_Invalid_Ref_Pulses_Threshold	Threshold on the value of num_of_mie_invalid_reference_pulse (see element 41 in table 17 of section 5.3 of TN2.1)		IntAI	89
L1B_Rayl_Invalid_Meas_Threshold	Threshold on the value of num_of_rayleigh_invalid_measurements (see element 42 in table 17 of section 5.3 of TN2.1)		IntAI	79
L1B_Rayl_Invalid_Ref_Pulses_Threshold	Threshold on the value of num_of_rayleigh_invalid_reference_pulse (see element 43 in table 17 of section 5.3 of TN2.1)		IntAI	91
Total size for XML in bytes:				1733

Table 123: L1B_Mie_Meas_Screening_Params_Content_Description

Tag Name	Content Description	Unit	Type	Size (XML)
L1B_Mie_Meas_Invalid_Ref_Pulses_Threshold	Threshold on the value of num_of_mie_invalid_reference_pulses (see element 1 in table 19 of section 5.3 of TN2.1)		IntAI	99
L1B_Avg_Laser_Freq_Offset_Min	Minimum allowed value for Avg_Laser_Frequency_Offset (see element 2 in table 19 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	80
L1B_Avg_Laser_Freq_Offset_Max	Maximum allowed value for Avg_Laser_Frequency_Offset (see element 2 in table 19 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	80
L1B_Avg_UV_Energy_Min	Minimum allowed value for Avg_UV_Energy (see element 3 in table 19 of section 5.3 of TN2.1)	mJ	FAdoxy	58
L1B_Avg_UV_Energy_Max	Maximum allowed value for Avg_UV_Energy (see element 3 in table 19 of section 5.3 of TN2.1)	mJ	FAdoxy	58
L1B_Laser_Freq_Offset_Stdev_Threshold	Threshold on the value for Laser_Frequency_Offset_Std_Dev (see element 4 in table 19 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	96
L1B_UV_Energy_Stdev_Threshold	Threshold on the value for UV_Energy_Std_Dev (see element 5 in table 19 of section 5.3 of TN2.1)	mJ	FAdoxy	78
L1B_Vel_of_Att_Uncertainty_Error_Min	Minimum allowed value for Velocity_of_Attitude_Uncertainty_Error (see element 6 in table 19 of section 5.3 of TN2.1)	m/s	FAdoxy	88
L1B_Vel_of_Att_Uncertainty_Error_Max	Maximum allowed value for Velocity_of_Attitude_Uncertainty_Error (see element 6 in table 19 of section 5.3 of TN2.1)	m/s	FAdoxy	88



	table 19 of section 5.3 of TN2.1)			
L1B_Mie_Mean_Emitted_Freq_Min	Minimum allowed value for Mie_Mean_Emitted_Frequency (see element 7 in table 19 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	80
L1B_Mie_Mean_Emitted_Freq_Max	Maximum allowed value for Mie_Mean_Emitted_Frequency (see element 7 in table 19 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	80
L1B_Mie_Emitted_Freq_Stdev_Threshold	Threshold on the value of Mie_Emitted_Frequency_Std_Dev (see element 8 in table 19 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	94
L1B_Meas_Reference_Pulse_FWHM_Min	Minimum allowed value for L1B PCD measurement-level parameter Reference_Pulse_FWHM	PixelIndex	FAdoxy	92
L1B_Meas_Reference_Pulse_FWHM_Max	Maximum allowed value for L1B PCD measurement-level parameter Reference_Pulse_FWHM	PixelIndex	FAdoxy	92
L1B_Scattering_Ratio_Min	Minimum allowed value for Scattering_Ratio_Mie (see element 2 in table 21 of section 5.3 of TN2.1)		FAdoxy	64
L1B_Scattering_Ratio_Max	Maximum allowed value for Scattering_Ratio_Mie (see element 2 in table 21 of section 5.3 of TN2.1)		FAdoxy	64
L1B_Mie_SNR_Threshold	Threshold on the value of Mie_Signal_to_Noise_Ratio (see element 3 in table 21 of section 5.3 of TN2.1)	unitless	FAdoxy	58
Mie_Ground_Bin_Thickness_Threshold	Threshold on the part of the ground bin that is above the surface according to the DEM.	m	FAdo40	80
Max_Signal_Derivative	Threshold on the Mie spectrum to be able to detect corrupt channels	PixelLevel	IntAs	54
Pixel_Saturation_Threshold	Threshold on the Mie spectral channels to be able to detect saturated channels	PixelLevel	IntAs	64
Total size for XML in bytes:				1547

Table 124: L1B Rayleigh Meas Screening Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L1B_Rayleigh_Meas_Invalid_Ref_Pulses_Threshold	Threshold on the value of num_of_Rayleigh_invalid_reference_pulses (see element 1 in table 23 of section 5.3 of TN2.1)		IntAI	109
L1B_Avg_Laser_Freq_Offset_Min	Minimum allowed value for Avg_Laser_Frequency_Offset (see element 2 in table 23 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	80
L1B_Avg_Laser_Freq_Offset_Max	Maximum allowed value for Avg_Laser_Frequency_Offset (see element 2 in table 23 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	80
L1B_Avg_UV_Energy_Min	Minimum allowed value for Avg_UV_Energy (see element 3 in table 23 of section 5.3 of TN2.1)	mJ	FAdoxy	58
L1B_Avg_UV_Energy_Max	Maximum allowed value for Avg_UV_Energy (see element 3 in table 23 of section 5.3 of TN2.1)	mJ	FAdoxy	58
L1B_Laser_Freq_Offset_Stdev_Threshold	Threshold on the value of Laser_Frequency_Offset_Std_Dev (see element 4 in table 23 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	96
L1B_UV_Energy_Stdev_Threshold	Threshold on the value of UV_Energy_Std_Dev (see element 5 in table 23 of section 5.3 of TN2.1)	mJ	FAdoxy	74
L1B_Vel_of_Att_Uncertainty_Error_Min	Minimum allowed value for Velocity_of_Attitude_Uncertainty_Error (see element 6 in table 23 of section 5.3 of TN2.1)	m/s	FAdoxy	88
L1B_Vel_of_Att_Uncertainty_Error_Max	Maximum allowed value for Velocity_of_Attitude_Uncertainty_Error (see element 6 in table 23 of section 5.3 of TN2.1)	m/s	FAdoxy	88
L1B_Rayleigh_Mean_Emitted_Freq_Min	Minimum allowed value for Rayleigh_Mean_Emitted_Frequency (see element 7 in table 23 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	90
L1B_Rayleigh_Mean_Emitted_Freq_Max	Maximum allowed value for Rayleigh_Mean_Emitted_Frequency (see element 7 in table 23 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	90
L1B_Rayleigh_Emitted_Freq_Stdev_Threshold	Threshold on the value of Rayleigh_Emitted_Frequency_Std_Dev (see element 8 in table 23 of section 5.3 of TN2.1)	GigaHertz	FAdoxy	104
L1B_Rayleigh_SNR_Min	Minimum allowed value for Rayleigh_Signal_to_Noise_Ratio_Channel_A and Rayleigh_Signal_to_Noise_Ratio_Channel_B (see elements 2 and 3 in table 25 of section 5.3 of TN2.1)	unitless	FAdoxy	56
L1B_Rayleigh_SNR_Max	Maximum allowed value for Rayleigh_Signal_to_Noise_Ratio_Channel_A and Rayleigh_Signal_to_Noise_Ratio_Channel_B (see	unitless	FAdoxy	56



	elements 2 and 3 in table 25 of section 5.3 of TN2.1)			
Rayleigh_Ground_Bin_Thickness_Threshold	Threshold on the part of the ground bin that is above the surface according to the DEM.	m	FAdo40	90
Pixel_Saturation_Threshold	Threshold on the Rayleigh channels to be able to detect saturated signals	PixelLevel	IntAs	64
Total size for XML in bytes:				1281

Table 125: L2B_AMD_Screening_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L2B_AMD_p_min	Minimum pressure allowed in a pressure profile (when a tested profile is outside this range the L2B_AMD_Screening_QC field in table 30 of section 5.3 of TN2.1 is set to L2B_AMD_Unlikely_Profile)	Pa	FAdoxy	42
L2B_AMD_p_max	Maximum pressure allowed in a pressure profile (when a tested profile is outside this range the L2B_AMD_Screening_QC field in table 30 of section 5.3 of TN2.1 is set to L2B_AMD_Unlikely_Profile)	Pa	FAdoxy	42
L2B_AMD_T_min	Minimum temperature allowed in a temperature profile (when a tested profile is outside this range the L2B_AMD_Screening_QC field in table 30 of section 5.3 of TN2.1 is set to L2B_AMD_Unlikely_Profile)	K	FAdoxy	42
L2B_AMD_T_max	Maximum temperature allowed in a temperature profile (when a tested profile is outside this range the L2B_AMD_Screening_QC field in table 30 of section 5.3 of TN2.1 is set to L2B_AMD_Unlikely_Profile)	K	FAdoxy	42
Total size for XML in bytes:				168

Table 126: AMD_Matchup_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Matchup_Method	Matchup method to be used for L1B-AMD matchup. See Table 127 for a list of valid values.		Enum	80
Max_Allowed_Time_Diff	Maximum allowed time difference in seconds between L1B BRC and AMD DSR	s	IntAul	64
Max_Allowed_Distance	Maximum allowed distance in kilometres between L1B BRC and AMD DSR	km	IntAul	64
Total size for XML in bytes:				208

Table 127: Valid values for AMD_Matchup_Params parameter Matchup_Method

Matchup Method	Description
Dummy	One-for-one between L1B BRC and AMD DSR
Nearest_Neighbour	Nearest-neighbour in space and time
...	

Table 128: CLM_Matchup_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Matchup_Method	Matchup method to be used for L1B-CLM matchup. See Table 129 for a list of valid values.		Enum	80
Total size for XML in bytes:				80

Table 129: Valid values for CLM_Matchup_Params parameter Matchup_Method

Matchup Method	Description
Dummy	TBD
Nearest_Neighbour	Nearest-neighbour in space and time



Table 130: ZWC Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
ZWC_Scheme_Mie	Zero-Wind Correction scheme to be used for L2B Mie processing. See Table 131 for a list of valid values.		Enum	80
ZWC_Scheme_Rayleigh	Zero-Wind Correction scheme to be used for L2B Rayleigh processing. See Table 131 for a list of valid values.		Enum	80
Mie_Ground_Correction_Weighting	Mie ground correction weighting factor	Scalar (no unit)	FAdoxy	90
Mie_HBE_Ground_Correction_Weighting	Mie HBE ground correction weighting factor	Scalar (no unit)	FAdoxy	98
Rayleigh_Ground_Correction_Weighting	Rayleigh ground correction weighting factor	Scalar (no unit)	FAdoxy	100
Rayleigh_HBE_Ground_Correction_Weighting	Rayleigh HBE ground correction weighting factor	Scalar (no unit)	FAdoxy	108
Mie_Rayleigh_Ground_Correction_Weighting	Mie-Rayleigh ground correction weighting factor	Scalar (no unit)	FAdoxy	108
Mie_Rayleigh_HBE_Ground_Correction_Weighting	Mie-Rayleigh HBE ground correction weighting factor	Scalar (no unit)	FAdoxy	112
Mie_Rayleigh_Ground_Correction_Offset	Mie-Rayleigh ground correction weighting factor	m/s	FAdoxy	102
Total size for XML in bytes:				878

Table 131: Valid values for ZWC Params parameters ZWC Scheme Mie and ZWC Scheme Rayleigh

ZWC Scheme	Description
ZWC_Scheme_use_total_L1B_corr	Use total L1B correction from the L1B GWD ADS
ZWC_Scheme_copy_L1B_settings	Re-compute using L1B settings (not recommended)
ZWC_Scheme_use_L2B_settings	Re-compute using L2B settings from AUX_PAR_2B ZWC_Params for the factors to weight the L1B GWD ADS ground correction velocities

5.5. Files supplied to the L2-PF and National Weather Services

The need for predicted orbit files (MPL_ORBPRES) at the L2-PF (i.e. ECMWF) has been discussed in Section 1.2. L1B template files with predicted orbit locations would be an alternative.

The L2-PF and National Weather Services need to receive Rayleigh-Brillouin Correction data (AUX_RBC_L2) as often as it is generated, ideally every time an Instrument Spectral Registration is performed.

The working assumption is that L1B data (ALD_U_N_1B) transmitted to the L2-PF and National Weather Services will be in TGZ format (XML HDR plus DBL converted to BUFR) - see Section 1.2.

5.6. Level-2C Processing Parameters and Algorithm Settings



The Level-2C Processing Parameters file is notionally an auxiliary input to the L2C processor. The file defines the processor settings parameters, including algorithm settings for the L2C processor. It will contain settings for all switches that control the actions performed by the processor, and the algorithm settings needed to define operation of the L2C processor.

In practice, Level-2C Processing Parameters are defined by the operational data assimilation system at ECMWF. The file will be produced by ECMWF to record the settings used for assimilation of L1B/L2B Aeolus data within the ECMWF assimilation system. The evolution of ECMWF processing of Aeolus data can be tracked by examining copies of Level-2C Processing Parameters files stored in the Aeolus Ground Segment (e.g. the LTA).

5.6.1. Product Structure and Size

The Level-2C Processing Parameters file conforms to the Earth Explorer standard defined in Section 3.3, with an overall structure defined by [Table 132](#). It is contained in one product file, containing Fixed Header and Main Product Header as defined in sections 3.3.1 and 3.3.2 respectively, as well as a Specific Product Header and a single Data Set as defined in the following subsections. All headers and data sets are in XML format.

Note: a common MPH is retained for all auxiliary data files, but some parameters may in future be set to a “missing value” (GSDR RID 166).

In the tables below, all Types denoted FAdoxy have been allocated 10 bytes, i.e. x+y=8.

Table 132: Structure and Size of the L2C Processing Parameters file.

Name	Description / Comment	Type	Size (XML)
Fixed_Header	The default Earth Explorer FH structure, as defined in Table 6 .	Structure	699
Main_Product_Header	The default Earth Explorer MPH structure, as defined in Table 9 .	Structure	1582
Specific_Product_Header	A specific product header, specific for this filetype, as defined in Table 133 .	Structure	924
Level_2C_Proc_Params	The datablock containing the actual parameter settings, as defined in Table 134 .	Structure	15828
Total size for XML in bytes:			19034

5.6.1.1. FILE NAME

The Level 2C Processing Parameters file name has the format

AE_CCCC_AUX_PAR_2C_yyyymmddThhmmss_yyyymmddThhmmss_vvvv.EEF

The date/times (yyymmddThhmmss) represent the start and stop of the validity period. This validity period will generally extend over a long period of time, each validity period representing different phases of the ADM-Aeolus mission, over which the properties of the satellite may change. The version number combined with the date makes this a unique instance of the file.

This product file has an extension .EEF to designate a single file in XML format.

5.6.1.2. FILE STRUCTURE

5.6.2. Specific Product Header

The Specific Product Header section of the AUX_PAR_2C XML file is defined in [Table 133](#).



Table 133: Structure and content of the Specific Product Header of the AUX_PAR_2C file

Tag Name	Content Description	Unit	Type	Size (XML)
Sph_Descriptor	ASCII string describing this collection of settings		String	80
Spare				500
List_of_DSDs	A list of DSD's following the default Earth Explorer DSD structure, as defined in Table 10 , describing the attached data set. (There is just 1 DSD in this list)			344
Total size for XML in bytes:				924

5.6.3. Data Set Descriptor

Only a single Data Set appears in the Aeolus Level 2C Processing Parameters data file: the Level 2C Processing Parameters GADS, as described below.

5.6.4. Level 2C Processing Parameters GADS

Table 134: Level 2C Processing Parameters GADS Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L2C_FH_Default_Fields	Fields responsible for populating the Fixed Header. See Table 135 for the structure definition.		Structure	436
L2C_MPH_Default_Fields	Fields responsible for populating the Main Product Header. See Table 136 for the structure definition.		Structure	153
L2C_Assim_Params	Processing Parameters for the assimilation of L2B data. See Table 137 for the structure definition.		Structure	5742
L2C_Screening_Params	Collected Screening Parameters used for testing the input files and the generated results. See Table 138 for the structure definition.		Structure	9497
Total size for XML in bytes:				15828

Table 135: L2C_FH_Default_Fields Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
File_Description	1-line description of the file		String	63
Notes	Multi-lines free text		String	41
Mission	Aeolus		String	45
Mission_Id	AE		String	51
File_Class	1-line description of file class		String	51
File_Version	4 digits used to distinguish between versions of a file having the same validity period		IntAs	36
System	Aeolus L2CP		String	43
Creator	Aeolus L2CP		String	45
Creator_Version	Version of the tool		String	61
Total size for XML in bytes:				436

Table 136: L2C_MPH_Default_Fields Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
Ref_Doc	Reference document describing the product		String	45
Software_Ver	Software version number of processing software. Format: name of processor (up to 10 char) and version number (4 char)		String	55
Proc_Centre	Name of Processing Center		String	53
Total size for XML in bytes:				153

Table 137: L2C_Assim_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
File_Type	File Type String		String	49
Sph_Descriptor	ASCII string describing the product		String	59



Spare				500
Total size for XML in bytes:				5742

Table 138: L2C_Screening_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L2B_Input_Screening_Params	Parameters used for screening the L2B input data. See Table 139 for the structure definition.		Structure	7257
Spare				1000
Total size for XML in bytes:				9497

Table 139: L2B_Input_Screening_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L2B_Mie_Obs_Screening_Params	Parameters used for screening the L2B Mie observations from the L2B input data. See Table 140 for the structure definition.		Structure	2327
L2B_Rayleigh_Obs_Screening_Params	Parameters used for screening the L2B Rayleigh Observations from the L2B input data. See Table 141 for the structure definition.		Structure	2245
Total size for XML in bytes:				7257

Table 140: L2B_Mie_Obs_Screening_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L2B_Scattering_Ratio_Min	Minimum allowed value for Scattering_Ratio_Mie (see element 2 in table 21 of section 5.3 of TN2.1)		FAdoxy	64
L2B_Scattering_Ratio_Max	Maximum allowed value for Scattering_Ratio_Mie (see element 2 in table 21 of section 5.3 of TN2.1)		FAdoxy	64
L2B_Mie_SNR_Threshold	Threshold on the value of Mie_Signal_to_Noise_Ratio (see element 3 in table 21 of section 5.3 of TN2.1)	unitless	FAdoxy	58
Mie_Ground_Bin_Thickness_Threshold	Threshold on the part of the ground bin that is above the surface according to the DEM.	m	FAdo40	80
Max_Signal_Derivative	Threshold on the Mie spectrum to be able to detect corrupt channels	PixelLevel	IntAs	54
Pixel_Saturation_Threshold	Threshold on the Mie spectral channels to be able to detect saturated channels	PixelLevel	IntAs	64
Spare				1000
Total size for XML in bytes:				2327

Table 141: L2B_Rayleigh_Obs_Screening_Params Content Description

Tag Name	Content Description	Unit	Type	Size (XML)
L2B_Rayleigh_SNR_Min	Minimum allowed value for Rayleigh_Signal_to_Noise_Ratio_Channel_A and Rayleigh_Signal_to_Noise_Ratio_Channel_B (see elements 2 and 3 in table 25 of section 5.3 of TN2.1)	unitless	FAdoxy	56
L2B_Rayleigh_SNR_Max	Maximum allowed value for Rayleigh_Signal_to_Noise_Ratio_Channel_A and Rayleigh_Signal_to_Noise_Ratio_Channel_B (see elements 2 and 3 in table 25 of section 5.3 of TN2.1)	unitless	FAdoxy	56
Rayleigh_Ground_Bin_Thickness_Threshold	Threshold on the part of the ground bin that is above the surface according to the DEM.	m	FAdo40	90
Pixel_Saturation_Threshold	Threshold on the Rayleigh channels to be able to detect saturated signals	PixelLevel	IntAs	64
Spare				1000
Total size for XML in bytes:				2245

5.7. Auxiliary Calibration Coefficients Dataset

Auxiliary Calibration Coefficient data are contained in the AUX_CAL_L2 data product. The tables are to be generated by TBD. The format for these data are defined in Section 4.3 of [\[RD10\]](#). They contain instrument calibration coefficients for used in L2A processing, to account for Mie and Rayleigh channel



cross-talk, or to retrieve atmospheric optical properties. They are potentially used for similar purposes within L2B processing.